



# 18<sup>th</sup> WORLD CONGRESS OF NEUROSURGERY

**WFNS 2023**

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# ABSTRACT BOOK

## Introduction

This book contains the abstracts accepted for presentation at WFNS 2023 – the 18<sup>th</sup> World Congress of Neurosurgery – held in Cape Town, South Africa from 4 to 8 December 2023.

Abstracts were peer reviewed and designated for oral or poster presentation.

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## Organisation of the Book

Records are ordered numerically by abstract reference number and the record contains the topic and the type of presentation (oral or poster). The underlined author is the presenting author. The author index includes all authors and co-authors along with their abstract reference number.

### **The Scientific Programme Committee of the 18<sup>th</sup> World Congress of Neurosurgery**

Anthony Figaji (Chair)	Ahmed Alkani, Stereotactic and Functional
Andrew Reisner, Neurotrauma	Tiit Mathiesen, Ethics
Daniel Prevedello, Skull Base	Stefan Wolfsberger, Neuro-endoscopy
Stefan Florian, Vascular	Luis Borba, Education
Jörg-Christian Tonn, Neuro-oncology	Juan Luis Gomez Amador, Anatomy
Salman Sharif, Spine	Keki Turel, Complications
Abhaya Kulkarni, Paediatrics	Yuval Shapira, Peripheral Nerve
Kee Park, Global	

## Epilepsy

ePoster presentation

### Complete callosotomy in children with drop attacks: a retrospective monocentric study of 50 patients

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**Objectives:** The objective is to identify clinical markers that would predict a better outcome in terms of drop attacks and other types of epileptic seizures and to describe 20 years of experience with complete callosotomy at the Rothschild Hospital Foundation.

**Background:** Corpus callosotomy is a palliative neurosurgical treatment for patients with drug-resistant epilepsy and suffering from drop attacks, which are a source of major deterioration in quality of life and can be responsible for severe traumatic injury.

**Methods:** We reviewed a retrospective series of all children who underwent complete corpus callosotomy at our institution, since January 1998, until the end of 2021 and analysed the series between 1998 and February 2019, to have a minimum of 1 year postoperative follow up. We analyzed the neurological and cognitive pre- and postoperative status, radiological data, and electroencephalography (EEG) monitoring data.

**Results:** Sixty-four children underwent a complete callosotomy. In the sub-group we focused on, the mean age was 7.5 years. The median postoperative follow-up was 42.5 months. Forty-one patients (82%) had a favorable outcome, 29 (58%) of them becoming totally free of drop attacks, results were stable over time. Statistical analysis of correlation between outcome of drop attacks and the characteristics of the patients did not find any trend in terms of age, etiology or developmental level. Regarding seizure types, the probability of being drop attack-free was significantly higher in case of tonic seizures ( $p = 0.017$ ). Transient neurological complications occurred in two patients. A transient disconnection syndrome was observed in one child with good preoperative cognitive level.

**Conclusions:** Callosotomy is a well-tolerated procedure for children with drug-resistant epileptic drop attacks. Aside from a better surgical outcome for children with tonic seizures causing the falls, the lack of any other significant prognostic factor implies that no patient should a priori be excluded from this palliative surgical indication.

## Spine

Oral presentation

Economic performance of Oblique Lateral Lumbar Interbody Fusion (OLLIF) with a focus on hospital throughput efficiency

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**Objectives:** In recent years, the rate of disability due to low back pain has increased dramatically, and consequently, costs have skyrocketed [1, 12]. As such, advancements in the surgical treatment of lower back pain could benefit numerous patients annually and contribute to lower health care costs.

**Background:** Oblique posterior lateral lumbar fusion (OLLIF) is a surgical procedure designed for a minimally invasive spinal fusion. The OLLIF procedure allows for fusion of the lumbar spine through a single 10-15 mm incision, with faster surgery times and easier approach than any previous technique. This procedure is normally performed for patients that require a spinal fusion but do not want the recovery time required in a traditional spinal fusion surgery.

**Methods:** Anesthesia/surgery times and blood loss were recorded for all patients by clinic staff and entered into the EMR database immediately after surgery. Because no suction is used in OLLIF procedures, blood loss for the OLLIF group was measured by weighing sponges and subtracting dry weight.

**Results:** Overall, across all surgeries studied, LOS for OLLIF surgeries was 58.5% of that seen with TLIF surgeries (3.1 vs. 5.3 days). The trend of shorter LOS for OLLIF surgeries remained consistent when surgeries were stratified and matched for the same number of levels involved. Overall, when LOS was converted to inpatient operating costs of the hospital, the difference in cost of surgical admission was \$6,701 for OLLIF vs. \$11,583 for TLIF.

**Conclusions:** The cost reductions and faster recovery times associated with the OLLIF procedure make it an appealing alternative to the traditional open fusions available for patient and insurance providers. The reduction in the use of these key hospital resources suggests that hospitals that are constrained by OR or hospital bed availability may be able to achieve greater throughput efficiency by increasing the overall percentage of patients receiving the OLLIF surgery.



## Spine

ePoster presentation

### Physiologic decompression of lumbar spinal stenosis through OLLIF

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**Objectives:** In this study, we evaluate whether trans-Kambin oblique lateral lumbar interbody fusion (OLLIF) can effectively and safely relieve symptoms of LSS when an indication for fusion is present.

**Background:** Lumbar spinal stenosis (LSS) is one of the most common indications for spinal surgery. Traditionally, decompression is achieved by removing bony and ligamentous structures through open surgery. However, recent studies have shown that symptomatic relief can be accomplished in many patients by increasing intervertebral and interpedicular height using fusion alone.

**Methods:** This is a retrospective single surgeon cohort study of 187 patients with LSS who underwent 189 OLLIF procedures between 2012 and August 2, 2019. Inclusion criteria for this study were age > 18 years with symptoms of LSS, including pain, sensory, and motor deficits, and an additional indication for fusion, which included spondylolisthesis, degenerative disk disease, disk herniation, or scoliosis.

**Results:** ODI improved from 52% pre-op to 37% at the one-year follow-up. At the first follow-up, radiculopathy had resolved in 39% of patients, and 72% of patients experienced improvement of 50% or greater. One year after surgery, radiculopathy had resolved in 52% of patients and 74% experienced improvement of 50% or greater. Single-level surgeries required 56.4±21.5 minutes, with a mean hospital stay of 1.6±2.4 days. Nerve irritation occurred in 12% of patients at the first postoperative follow-up and persisted in 6.8% of patients one year after surgery.

**Conclusions:** Trans-Kambin OLLIF delivers anatomic restoration of intradiscal and interpedicular distance, which results in physiologic decompression of lumbar spinal stenosis in patients undergoing lumbar fusion for degenerative or herniated disk disease, spondylolisthesis, or scoliosis. Amongst patients with LSS, OLLIF results in significant improvement of radiculopathy and patient-reported disability in the majority of patients with low rates of long-term complications. Unlike other minimally invasive surgery (MIS) fusions, OLLIF can be safely used from T12-S1.

## Spine

Oral presentation

### Clinical and radiological outcomes of Oblique Lateral Lumbar Interbody Fusion (OLLIF)

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**Objectives:** To prove that the OLLIF technique should be considered a preferred option for lumbar spine fusions.

**Background:** Oblique lateral lumbar interbody fusion (OLLIF) is a recent innovation in MI spinal fusion. OLLIF is performed with the patient in the prone position and employs an oblique lateral approach that enables the instrumentation to pass through Kambin's triangle, which is defined as the space between the exiting nerve, the superior border of the caudal vertebra, and the superior articulating process of the inferior facet.

**Methods:** This study is a retrospective case series including 303 OLLIF procedures performed by the same surgeon. Procedures were performed in five Minnesota hospitals.

All patients underwent a full course of conservative therapy before being considered candidates for surgery.

Preoperative imaging included magnetic resonance imaging, X-ray of the lumbar spine with flexion and extension. OLLIF is indicated for severe degenerative disc disease, spondylolisthesis, and spinal stenosis.

**Results:** Perioperative outcomes are presented and stratified by the number of surgical levels. For a single-level OLLIF, mean surgery time was  $52 \pm 18.9$  minutes, with a blood loss of  $42.2 \pm 31.1$  mL,  $198.8 \pm 87.2$  seconds of fluoroscopy time and a hospital stay of  $2.2 \pm 1.7$  days. Linear regression shows that controlling for the number of levels, there is no significant impact of BMI on surgery time (OLS coefficient 0.23, 95% CI -0.15 to 0.61) and that each additional level of surgery increases surgery time by 24.9 (95% CI 21.72 to 28.10) minutes.

**Conclusions:** This study is the first to present outcomes in a large cohort of OLLIF patients. We demonstrate that OLLIF is a safe, efficient and efficacious technique for fusions of the lumbar spine from T12-L1 to L5-S1. In OLLIF. Based on our perioperative, clinical, and radiographic data we propose that OLLIF should be considered a preferred option for fusions of the lumbar spine.

## Spine

Oral presentation

### Effect of Body Mass Index on perioperative outcomes in minimally invasive OLLIF fusion versus open fusions: a multivariant analysis

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**Objectives:** The purpose of this study is to determine the effects of obesity on perioperative outcomes in OLLIF, MIS-TLIF, and TLIF.

**Background:** Obesity is an increasing public health concern associated with increased perioperative complications and expense in lumbar spine fusions. While open and mini-open fusions such as transforaminal lumbar interbody fusion (TLIF) and minimally invasive TLIF (MIS-TLIF) are more challenging in obese patients, new MIS procedures like oblique lateral lumbar interbody fusion (OLLIF) may improve perioperative outcomes in obese patients relative to TLIF and MIS-TLIF.

**Methods:**

We performed summary statistics to compare perioperative outcomes in MIS-TLIF, OLLIF, and TLIF. We performed multivariate regression to determine the effects of BMI on perioperative outcomes controlling for demographics and number of levels on which surgeries were operated.

**Results:** OLLIF significantly reduces surgery time, blood loss, and hospital stay compared to MIS-TLIF, and TLIF for all levels. MIS-TLIF and TLIF do not differ significantly except for a slight reduction in hospital stay for two-level procedures. On multivariate analysis, a one-point increase in BMI increased surgery time by  $0.56 \pm 0.47$  minutes ( $p = 0.24$ ) in the OLLIF group, by  $2.8 \pm 1.43$  minutes ( $p = 0.06$ ) in the MIS-TLIF group, and by  $1.7 \pm 0.43$  minutes ( $p < 0.001$ ) in the TLIF group. BMI has positive effects on blood loss for TLIF ( $p < 0.001$ ) but not for OLLIF ( $p = 0.68$ ) or MIS-TLIF ( $p = 0.67$ ). BMI does not have significant effects on length of hospital stay for any procedure.

**Conclusions:** Obesity is associated with increased surgery time and blood loss in TLIF and with increased surgery time in MIS-TLIF. Increased surgery time may be associated with increased perioperative complications and cost. In OLLIF, BMI does not affect perioperative outcomes. Therefore, OLLIF may reduce the disparity in outcomes and cost between obese and non-obese patients.

## Neurovascular Surgery

ePoster presentation

Burr hole–based resections of cerebral cavernous malformation (CM): a technical case report

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**Objectives:** To describe a surgical procedure that removes an intracranial CM through the craniotomy with the aid of a special tubular retractor using the least invasive technique to date.

**Background:** Large surgical incisions that expose substantial amounts of brain tissue lead to lot of complications in the process of resection of the deep-seated brains lesions. Fortunately, these complications are reduced when the surgeon uses a tubular retractor and smaller craniotomy to complete the procedure. Here we report the first ever use of a self-made tubular retractor to remove an intracranial cavernous malformation(CM) by burr hole technique.

**Methods:** We describe a patient with epilepsy as the initial symptom of an intracranial CM and the successful removal of the lesion by the burr hole technique. During the operation, we put the retractable tubular retractor into the brain through the burr hole with a diameter of only 1.2 cm and completely removed the lesion through a narrow corridor using a microscope.

**Results:** Using the burr hole technique and a retractable tube retractor, we completely removed the CM and hemosiderin. The patient tolerated the surgical procedure well, and the postoperative imaging examination indicated complete resection of the lesion.

**Conclusions:** The burr hole technique using a retractable tubular retractor in the removal of a deep intracranial CM offers several advantages over traditional surgery. This technique appears to be the least invasive method for the removal of intracranial CMs.



## Education, Ethics, Socioeconomic

ePoster presentation

Does maintenance of certification improve quality of care and promote patient safety?

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**Objectives:** ABMS member boards claim that there is a beneficial impact of MOC on patient outcomes. A review of the literature regarding MOC was done to attempt to answer the question of whether MOC improves patient outcomes, reduces medical errors, and/ or enhances patient safety.

**Background:** The American Board of Medical Specialties (ABMS) and American Board of Neurosurgery (ABNS) continue to adjust and refine the requirements for Maintenance of Certification (MOC). While maintaining certification is not mandatory, the process is new and not without controversy. Competing certification organizations have emerged and will be reviewed in this study.

**Methods:** A literature review was done by PubMed to determine if MOC enhances patient safety, improves quality, and/or improves patient outcomes. A total of 24 publications were reviewed. The majority of the papers were questionnaire-based and/or opinion papers. Response rates were assessed and sampling error analysis performed. A literature review was also done on a competing certification called NBPAS (National Board of Physicians and Surgeons). Organizations such as the National Committee for Quality Assurance (NCQA), Utilization Review Accreditation Commission (URAC), The Joint Commission, and Center for Medicare and Medicaid Services (CMS) were queried to see if such competing organizations meet the standards they require.

**Results:** No publications could be identified to conclude that the MOC process enhanced patient quality, improved patient outcomes, or enhanced patient safety. Competing organizations, namely the NBPAS, meet the standards of the NCQA, URAC, The Joint Commission, and CMS. Currently, 146 US hospitals accept both ABMS and NBPAS.

**Conclusions:** MOC is an important process for lifelong learning. The MOC process has not been without controversy, and competing organizations have emerged to reduce costs and burden to physicians. It cannot be concluded that patient safety, surgical outcomes, and patient care quality are improved by the MOC process in its current form.

## Neurovascular Surgery

ePoster presentation

Delayed subarchnoid haemorrhage in post-operative case of pituitary macro-adenoma

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**Objectives:** To discuss about the reason of delayed subarachnoid haemorrhage in post operative case of pituitary tumor.

**Background:** After removal of pituitary macroadenoma, the anterior communicating artery (ACoM) descends toward the original position. However, the process and contributing factors of this descent are not elucidated. Cerebral vasospasm following a transsphenoidal resection of a pituitary adenoma is a devastating occurrence that can lead to delayed cerebral ischemia and poor neurologic outcome if not diagnosed and treated in a timely manner. The etiology of this condition is not well understood but can lead to significant arterial vasospasm that causes severe ischemic insults. Early postoperative events, such as peritumoral subarachnoid hemorrhage and hemiparesis, may be factors associated with post-transsphenoidal surgery vasospasm. BUT in our case nothing such thing happened.

**Methods:** A 57/M came with c/c of decreased vision of left eye since 6 months. he also had Holocranial headache and Genral Body weakness. on examination he had bitemporal hemianopia. Hormonal profile was normal. Sublabial transshphenoidal excision of tumor was done. Post-operative period was uneventful and post operative CT brain was also normal. on POD-4 his GCS dropped and CT brain was done which showed SAH. CT angio was done which showed Acom Aneurysm.

**Results:** Unfortunately patient died despite of all measures.

**Conclusions:** Many articles has showed, immediate post operative SAH, rupture of Acom Aneurysm but in our case such thing didn't happened. so what was the reason for mortality?

## Education, Ethics, Socioeconomic

ePoster presentation

Experience of hundred cases as young neurosurgeon

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**Objectives:** To tell the experience of the learning curve faced during the practice after training period.

**Background:** Each year, 13.8 million patients need neurosurgical interventions, and as many as 5 million do not have access to safe and affordable neurosurgery. Most of these patients live in low and middle income countries. Young Neuro surgeon has a lot of duty to fulfil.

**Methods:** Residency programme in India was started in 1958 at Christian Medical College, Vellore. The basic structure of the programme is learning neurology, learn to treat indoor and outdoor patients, reading various types of radiological investigations and planning the case. Junior residents are mostly posted in wards, ICUs which help them to learn manage Neurosurgery emergencies and manage patients after surgery also; this practise seems better compared to places where neurosurgery ICUs are managed by intensivists.

**Results:** Overcoming challenges

Immediate post residency, one needs a mentor who can be from within the institute or outside where one works. I was lucky enough. When I moved to a premiere institute in Chandigarh, a whole newer aspects of neurosurgery was laid before me. And after finishing the observership, I was lucky to find a teacher/mentor in one of the senior consultants in corporate set up who helped me build up my confidence. The options of observership and fellowship should be widely made available through various societies and one should pursue these courses following residency training which I underestimated during my residency. COVID pandemic has tested everyone, trained or under trained.

**Conclusions:** Residency programme needs to be real. Access to cadaver lab, hands on during residency should be made essential part of the training. Fellowship no longer seems to be optional but a must in this era of sub specialization. Mentorship is a necessary part of self growth. It helps you navigate through both personal and professional crisis.

## Oncology

ePoster presentation

### Hypothalamic-Pituitary region infection or tumor? In immunocompetent patient

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**Objectives:** to discuss about the aspect of clinic picture of pituitary tumors or infections.

**Background:** Infections of the hypothalamic-pituitary region are rare and commonly described in case reports or small case series. These infections include bacterial infections (pituitary abscess), tuberculosis, fungal, viral, and parasitic infections. An infection in the hypothalamic-pituitary region may present as a sella/suprasellar mass and may be misinterpreted as a pituitary tumor. Also, these infections may cause hypopituitarism and be misdiagnosed as post-encephalitic syndrome.

**Methods:** 38/M came with Chief complaints of Raised ICP, Decreased Vision. No History of Covid 19. On MRI Images it showed sella/suprasellar mass. Patient was taken for surgery. endoscopic Transnasal transsphenoidal approach was used. During surgery, it was difficult to remove the mass during nasal segment. Microdebrider was also used. sample was sent for crush smear. it confirmed that it is a fungal mass. partial Debulking of mass was done. Histopathology and culture report proved it was fungal mass.

**Results:** Patient was started on Amphotericin B followed by tab voriconazole. Headache and vision improved day by day and in MRI size of the lesion also reduced.

**Conclusions:** The correct diagnosis of this disease can only be established by histopathological examination of tissue obtained at surgery. The optimal treatment is surgical resection through transsphenoidal approach combined with antifungal therapy preferably with voriconazole, which has made good prognosis in most cases of fungal mass.



## Neurovascular Surgery

ePoster presentation

Intraoperative aneurysm rupture: an analysis after operating 1987 cases over 20 years

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**Objectives:** To analyse the incidence of IOR and its temporal occurrence over 20 years duration.

**Background:** Intraoperative aneurysm rupture can lead to an havoc inside operating room. Managing the situation can improve the outcome but prevention of this situation can significantly boost the confidence.

**Methods:** A total of 1987 cases underwent surgical management since the year 2000 at the hands of single surgeon and at the same institution. Incidence of intraoperative rupture was noted alongside stage of rupture and surgical procedure was analysed.

**Results:** Incidence of IOR decreased significantly over time and dissection along the fundus was major determinant causing IOR. Tentative clipping was also a good option so as to keep temporary clipping time under check.

**Conclusions:** Rather than IOR, it's the fumbling with instruments at the moment of rupture which spoils the outcome.

## Skull Base

Oral presentation

An analysis of 293 cases of skull base aspergillosis over 22 years

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**Objectives:** To analyse the outcomes in skull base aspergillosis using varying anti-fungal formulations.

**Background:** Invasive skull base aspergillosis is rarely encountered in neurosurgeon's lifetime. This inflammatory pathology of skull base continues to carry nihilistic approach and management strategy from clinicians, worldwide.

**Methods:** Since 2001, a total of 292 patients harboring invasive intracranial aspergillosis were managed under neurosurgical services. Age ranged from 6 years to 75 years. During first 5 years majority of patients were administered Amphoterecin B (n = 45), while last 5 years witnessed a dramatic rise of usage of voriconazole (n = 247) as single anti-fungal chemotherapeutic agent in oral formulation. The radiological profile, hallmark features, differential diagnoses were noted. Nasal endoscopy for establishing the diagnosis was used in last 10 years in 168 patients.

**Results:** Twenty patients of 45 expired after getting Amphoterecin in variable cumulative drug dosages. The outcome improved dramatically after the availability of voriconazole. There were only 8 deaths of 247 patients in voriconazole group. Side-effects like photo-sensitivity were the commonest.

**Conclusions:** Voriconazole provides better disease control with significantly lower side-effects. Long-term results need to be evaluated at prolonged follow-ups.

## Paediatric

Oral presentation

### Risk factors for intracranial aneurysm rupture in pediatric patients

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**Objectives:** The aim of this study is to reveal risk factors related to the rupture of Intracranial aneurysms (IAs) in pediatric patients.

**Background:** IA rupture in pediatric patients is a rare but fatal condition. Although risk factors for aneurysm rupture in adults have been well documented, they remain unknown in pediatric patients.

**Methods:** Data for 94 pediatric patients with IAs were retrospectively analyzed. The patients were divided into ruptured and unruptured groups. Risk factors for aneurysm rupture were analyzed through univariable and multiple logistic regression analyses. Typical patients with risk factors were described.

**Results:** Univariable analyses showed that the unruptured group had significantly higher percentages of giant aneurysms (43.2% vs 12.3%,  $P = 0.002$ ), wide-neck aneurysms (67.6% vs 29.8%,  $P = 0.001$ ), and aneurysms located in the internal carotid artery (40.5% vs 3.5%,  $P < 0.001$ ), while the ruptured group had significantly higher percentages of patients younger than 5 years old (28.1% vs 5.4%,  $P = 0.013$ ) and aneurysms located in the anterior cerebral artery (24.6% vs 5.4%,  $P = 0.032$ ), posterior cerebral artery (14.0% vs 0%,  $P = 0.045$ ), and distal arterial region (DAR) (46.8% vs 27.0%,  $P < 0.001$ ). Multiple logistic regression analysis confirmed that age 0-5 years ( $OR = 6.844$ ,  $P = 0.042$ ) and IAs located in the DAR ( $OR = 4.162$ ,  $P = 0.029$ ) were independently related to an increased risk of rupture. Wide-necked aneurysms ( $OR = 0.235$ ,  $P = 0.047$ ) were independently associated with a lower risk of rupture.

**Conclusions:** Among pediatric patients, age younger than 5 years and lesions located in the DAR are independent risk factors for IA rupture, while an IA with a wide neck acts as a protective factor.

## Skull Base

Oral presentation

Features of surgical treatment of patients with invasively growing malignant tumors of sinonasal localization: experience of treatment of 300 patients

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**Objectives:** Approximately 50% of all malignant tumors are epithelial tumors and affect the anterior skull base.

Tumors of the paranasal sinuses grow asymptotically for a long time and are more often found in the late or end stages: the frequencies of T1 and T4 stages are 10% and 55% respectively. It requires an interdisciplinary approach and the implementation of a comprehensive treatment.

The setting of precise indications and contraindications to the surgery.

**Background:** To present an optimal method for preparing the patient for surgery. The choice of surgical technique (biopsy, transcranial tumor removal, endoscopic tumor removal, combined tumor removal, craniofacial resection). The choice of skull base defect reconstruction mode.

**Methods:** Various surgical approaches and types of surgical interventions have been used. Planning operations, as well as evaluating the radicality of tumor removal based on MRI, CT and endoscopic examination. Different methods of skull base reconstruction after craniofacial resection were investigated. Endoscopic assistance was used to control the reconstruction quality intra- and postoperatively.

**Results:** A single-institution experience in the treatment of 250 patients with primary sinonasal malignancies with dural and brain involvement was performed. Tumor initial sites were nasal cavity, paranasal sinuses and nasopharynx. These tumors usually destruct anterior skull base and invade dura and brain tissue. We performed craniofacial resection in 28%, subtotal removal in 24% and biopsy in 48%. Complications of craniofacial resection and subtotal removal were pointed: nasal CSF leak (15%), infectious and inflammatory complications (10%), oculomotor and visual impairment (5%), autograft necrosis (5%), anemia (20%). The mortality rate was 2%. The follow-up period was 4.5 years.

**Conclusions:** Further research is needed to improve the results of complex treatment and reduce the incidence of postoperative complications in patients with malignant tumors of the skull base. There is a high risk of postoperative complications in cases of radical craniofacial resection.



## Peripheral

Oral presentation

Neuropathic pain relief after surgical neurolysis in patients with traumatic brachial plexus injuries: a preliminary report

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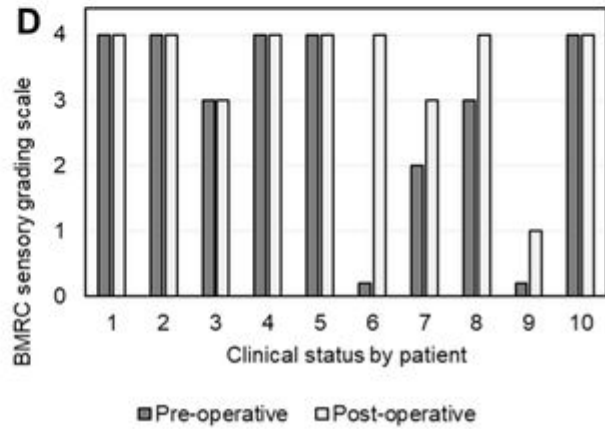
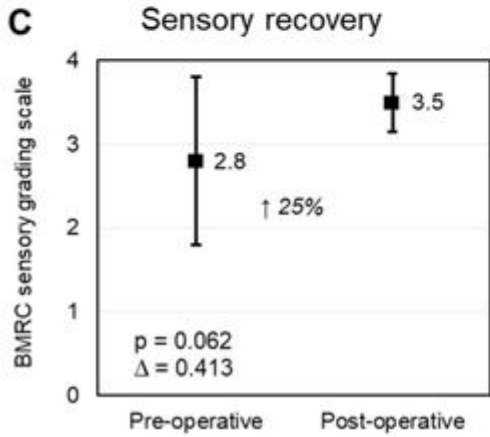
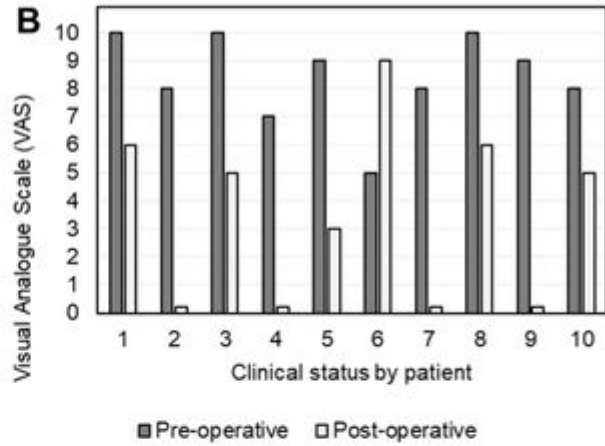
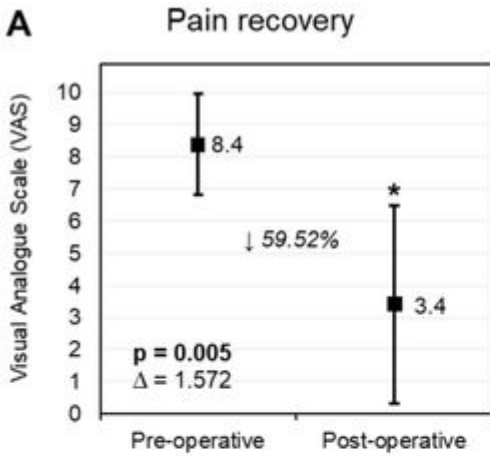
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**Objectives:** To evaluate the usefulness of surgical neurolysis for neuropathic pain relief in patients with posttraumatic brachial plexus injury (BPI).

**Background:** Neuropathic pain can result from nerve compression in posttraumatic BPI, produced by the connective tissue that surrounds the nerve structures, generating a compressive phenomenon. There are no articles that aim to evaluate the specific role of pain recovery in BPI after surgical neurolysis alone.

**Methods:** A prospective, longitudinal, nonrandomized, self-controlled before and after study was performed to evaluate the pain changes according to their intensity using the Visual Analogue Scale (VAS), and the sensory recovery after surgery using the British Medical Research Council (BMRC) scale for sensory recovery. To establish significant changes, a paired *T*-test was performed, and in order to determine the magnitude of these changes, an effect size was measured.  $\alpha = 0.05$ .

**Results:** Ten patients were included with an average follow-up of  $61.9 \pm 53.62$  months. The main mechanism of injury was vehicular trauma (70%). A significant decrease in pain after the surgical intervention was observed resulting from an average preoperative state according to VAS of  $8.4 \pm 1.58$ , to a postoperative state of  $3.4 \pm 3.27$  (59.52%,  $p = 0.005$ ,  $\Delta = 1.572$ ), added to a mean sensory improvement (25%) from  $2.8 \pm 1.62$  to  $3.5 \pm 0.97$  after surgery according to BMRC, without statistically significant changes ( $p = 0.062$ ), showing a moderate effect size ( $\Delta = 0.413$ ) (Figure 1). Almost all patients showed improvement in the continuous and paroxysmal pattern of pain. No postoperative complications were observed.



**Conclusions:** These results suggest that in cases of BPI that originates from a compressive syndrome secondary to the posttraumatic fibrosis that surrounds the nerve structures causing strangulation and inducing hypernociception, the use of surgical neurolysis is an appropriate alternative for patients with medically refractory neuropathic pain.

## Peripheral

ePoster presentation

Clinical outcomes report in different brachial plexus injury surgeries: a systematic review

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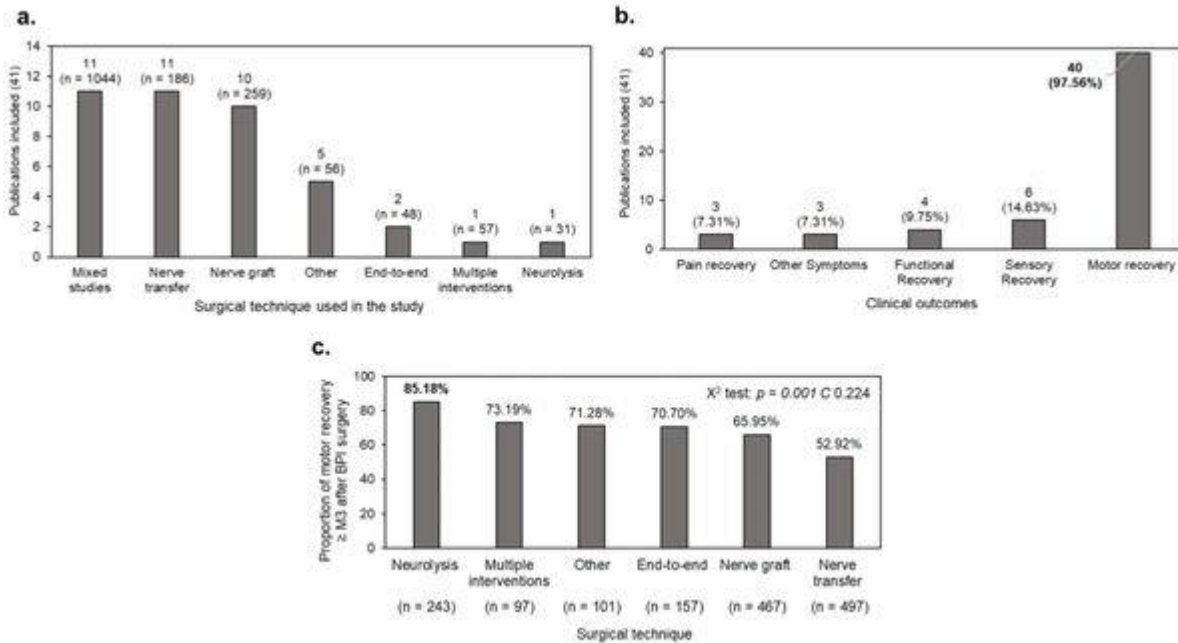
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**Objectives:** To evaluate the functional outcomes after surgery in brachial plexus injury.

**Background:** BPI is a lesion that results in loss of function of the arm, and there are multiple ways of surgically approaching its treatment. Controlled trials that compare all surgical repair strategies and their clinical outcomes have not been performed.

**Methods:** A systematic review was conducted to identify all articles that reported clinical outcomes in different surgeries (nerve transfer, nerve graft, neurolysis, end-to-end, multiple interventions, and others). Advanced search in PubMed was performed using the Mesh terms "brachial plexus injury" and "surgery", obtaining a total of 2153 articles. The clinical data for eligibility extraction was focused on collecting motor, sensory, pain, and functional recovery. A statistical analysis was performed to find the superior surgical techniques in terms of motor recovery. The frequency and the manner in which clinical outcomes are recording were described.

**Results:** The differences that correspond to the demographics and procedural factors were not statistically significant among groups ( $p > 0.05$ ). Neurolysis showed the highest proportion of motor recovery (85.18%), with significant results between preoperative and post-operative motor assessment ( $p = 0.028$ ). The proportion of motor recovery in each group according to the surgical approach differed significantly ( $X^2 = 82.495$ ,  $p = 0.0001$ ). The motor outcome was the most reported clinical outcome (97.56%), whereas the other clinical outcomes were reported in less than 15% of the included articles (Figure 1).



**Conclusions:** Unexpectedly, neurolysis, a technique displaced by new surgical alternatives such as nerve transfer/graft, demonstrated the highest proportion of motor recovery. Clinical outcomes such as pain, sensory, and functional recovery were infrequently reported. These results introduce the need to re-evaluate neurolysis through comparative clinical trials, as well as to standardize the way in which clinical outcomes are reported.



## Peripheral

Oral presentation

### Motor recovery after surgical neurolysis in brachial plexus neuropathy: a case series and systematic review

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**Objectives:** To evaluate the usefulness of surgical neurolysis for motor restoration in brachial plexus neuropathy (BPN).

**Background:** Surgical neurolysis consists of dissecting the connective tissue that surrounds the injured nerve structures in BPN, unfortunately, this technique has been displaced by the popularization of other types of interventions. However, recent studies have shown its possible impact on motor restoration.

**Methods:** A case series of patients with BPN who underwent surgical neurolysis was carried out focused on the British Medical Research Council motor grading scale (BMRC) clinical assessment of recovery. Added to a literature review of the motor recovery regarding surgical neurolysis for BPN.

**Results:** Eighteen patients were evaluated, clinical assessment after surgical intervention showed an increase of 58% in muscle strength according to BMRC, resulting from an average preoperative state of  $2.17 \pm 1.15$  to a postoperative condition of  $3.44 \pm 1.34$ , exhibiting statistically significant changes ( $p = 0.003$ ,  $d = 0.913$ ). Relative to the systematic review, 2298 articles were identified, considering 8 articles published between 1995 and 2021 for the qualitative analysis, and 2 for the quantitative synthesis, the analysis showed that surgical neurolysis favors motor recovery in BPN patients (RR: 0.76 (CI: 0.59 – 0.97)).

**Conclusions:** Both the case series and the literature review demonstrate considerable motor recovery. Even so, due to the lack of complete clinical trials, these results highlight the need to re-evaluate the usefulness of surgical neurolysis, a technique that has been displaced and considered by some authors as ineffective, conducting well-designed, powered, randomized, and blinded clinical trials to corroborate the apparent effectiveness of this technique for motor restoration.

## Peripheral

Oral presentation

Pain and sensory symptoms in brachial plexus neuropathy: outcomes after surgery and proposal of a sensory frequency of symptoms scale

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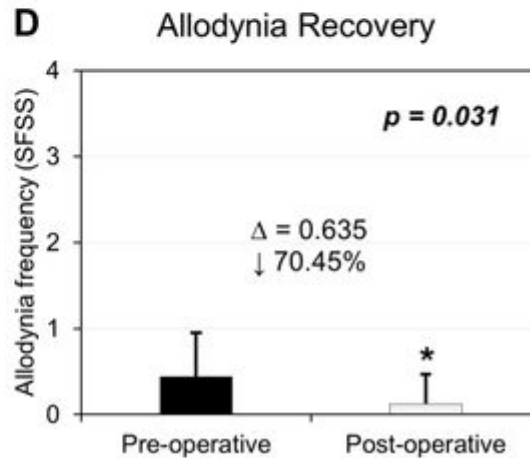
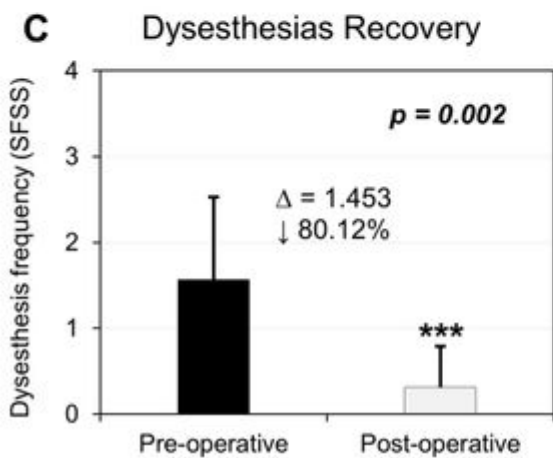
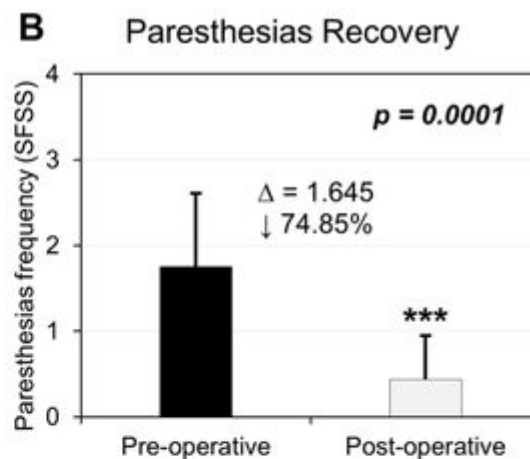
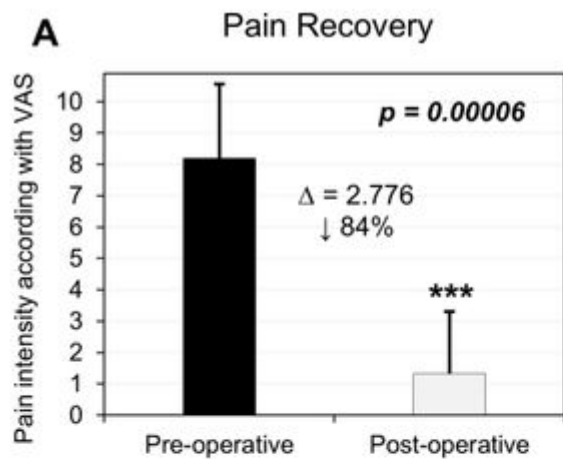
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**Objectives:** Evaluate surgical decompression in terms of pain, and frequency of positive sensory symptoms (PSS) in adult patients with brachial plexus neuropathy (BPN) of compressive origin. In addition, the study seeks to establish the relationship between the intensity of neuropathic pain and the frequency of PSS.

**Background:** There are no articles that aim to evaluate the specific role of surgical decompression on the recovery of pain and PSS in patients with BPN, as well as the relationship between pain and frequency of sensory manifestations.

**Methods:** A prospective before and after study was performed, considering the pain intensity through the visual analogue scale (VAS), and the frequency of PSS through a proposed new scale: Sensory Frequency of Symptoms Scale (SFSS). To compare the patients before and after the intervention, a Wilcoxon signed-rank test, and Cohen's D test were made, coupled with a Spearman analysis in order to establish the relationship between pain and PSS.

**Results:** Sixteen patients were included in the study, the clinical evaluation showed changes in pain according with VAS, going from a mean preoperative state of 8.19 to 1.31 after surgery, showing significant changes (84%,  $p < 0.00006$ ,  $\Delta = 2.776$ ). Within the PSS, a significant decrease was observed in paresthesias (74%,  $p < 0.0001$ ,  $\Delta = 1.645$ ), dysesthesias (80%,  $p < 0.002$ ,  $\Delta = 1.453$ ), and allodynia (70%,  $p = 0.031$ ,  $\Delta = 0.635$ ). Conversely, the preoperative correlation analysis between pain and dysesthesias/allodynia showed a low and non-significant relationship ( $R < 0.4$ ,  $p > 0.05$ ).



**Conclusions:** Surgical decompression is an effective technique for the relief of pain and sensory manifestations in adult patients with BPN of compressive origin. No relationship was observed between pain and dysesthesias/allodynia. Therefore, during clinical evaluation, they should be considered as independent manifestations, highlighting the need to validate new scales.

## Skull Base

ePoster presentation

### Intracranial granulocytic sarcoma: a rare entity

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**Objectives:** To Show intracranial granulocytic sarcomas can mimic as meningiomas.

**Background:** Granulocytic sarcoma is a rare but well-known extramedullary manifestation of acute/chronic leukemia or myelodysplastic syndrome, with estimated incidence of 0.7 in 1 million children and 2 in 1 million adults, can occur at any age and can involve any organ throughout the body, such as soft tissues, skin, bones, lymph nodes, gastrointestinal and genitourinary tracts, heart, orbit, head and neck region, mediastinum and sanctuary sites, testis, and central nervous system (CNS). CNS involvement by GS is present in only 0.4% of patients with AML, while aleukemic involvement of brain parenchyma is rarer, mentioned only in case reports/series.

**Methods:** we report a case of 49-year-old male who presented with Headache. Neuroimaging revealed multiple space occupying lesion in right fronto-parietal, left temporal and left occipital region. biggest lesion i.e on right side was excised under neuronavigation and with the help of cusa. Its immunohistochemistry studies was suggestive of granulocytic sarcoma. Patient received therapeutic cranial radiotherapy.

**Results:** After surgery patient is under follow up with no other complains and there is no deficit. patient was advised for Chemotherapy but refused.

**Conclusions:** Isolated primary intracranial GS is extremely rare, but relevant clinical information, including symptomatology, past or present history of any hematologic malignancy, proper neuroimaging, prompt pathological evaluation with use of IHC and IPT (from CSF when feasible) studies, and early start of systemic AML-like chemotherapy with cranial RT and HSCT, would promise a longer survival to these patients who are mostly young. Our case emphasizes the importance of the above and also highlights the use of proper histopathology and IHC facilities.

## Oncology

Oral presentation

### Primary brainstem tumors: whom, when and how to operate

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**Objectives:** Such issues as the optimal volume of tumor resection, the most appropriate surgical approaches for tumor removal remain the topic for discussion. We aimed to answer all these questions.

**Background:** Traditionally, the BsT divided into focal tumors, predominantly pilocytic astrocytomas, in which surgical treatment strictly recommended; and diffuse (astrocytomas II-IV), in which treatment is limited to adjuvant therapy. In fact, there is a wide range of brainstem neoplasms that are difficult to classify according to generally accepted classification. These BsTu demonstrate MRI signs of diffuse as well as focal lesion. In such cases, indications to surgery remain controversial.

**Methods:** 278 patients with BsTs operated in NSI in the period from 2005 to 2018. 45% were children, 55% were adults. In both age categories, the gender distribution was approximately equal: 48% - women, 52% - men. The clinical and MRI features, course of operation, the results of surgical treatment were analyzed.

**Results:** the indications for surgery were MRI - demarcated tumors, as well as tumors of the "intermediate" group. The aim of surgery was the maximum radicality of tumor removal, and at the same time the safety of functional structures. In endophytic tumors of the medulla oblongata and pons, we preferred lateral approaches, in which the tectum of the Bs remained intact. According to biopsy 67% were PA, 33% - gliomas II-IV. The outcomes of surgical treatment differed strictly in children and adults. In children, regress of neurological symptoms after surgery was observed in 79% and an increase only in 14%; while in adults, 33% improved, an increase of symptoms occurred in 43%. The revealed difference in surgical outcomes in children and adults age explained by the different ratio of benign and malignant tumors in these age groups.

**Conclusions:** BsTu are a heterogeneous group. Surgery in BsTu indicated in all cases except classical DIPG.

## Skull Base

ePoster presentation

Unilateral uvulotonsillar approach via a minimally invasive open-door suboccipital craniotomy to remove lesions of the fourth ventricle and dorsal brainstem

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**Objectives:** We propose a modified unilateral uvulotonsillar approach through midline suboccipital craniotomy with an open door to reduce soft tissue trauma, risk of CSF leaked and development of mutism in case of bilateral dissection of the uvulotonsillar fissure.

**Background:** To date, a median suboccipital craniotomy with access to the IV ventricle through the foramen of Magendie is widely used to remove lesions of the IV ventricle and brainstem. However, the median classic craniotomy is associated with the aforementioned complications.

**Methods:** We applied the modified approach in 104 patients and the standard technique in 96 patients. Surgeries were performed in the period from 2008 to 2022 by the senior author. All patients were above 18 years old. In the main group there was a slight female predominance (57,8%), while in the control group the gender distribution was equal.

The patients in the control group were operated using the standard technique. In the main group the modified approach was applied. Its main features are reduced median soft tissue incision, asymmetric keyhole open-door craniotomy, small dural semioval incision, unilateral uvulotonsillar fissure dissection.

**Results:** Most of the lesions in the main and control groups were in the brainstem (51,0% and 57,3%). Other localizations included IV ventricle and cerebellum. The most common neoplasm types were LGG (26,9% and 27,1%). The extent of resection was similar in both groups. There were no cases of CSF leaks, osteomyelitis and mutism in the main group, while in the control group the incidence of these complications comprised 1,0%, 3,1% and 1,0% accordingly.

**Conclusions:** This approach allows preservation of the normal anatomy of the craniovertebral junction. Unilateral dissection of the uvulotonsillar fissure provides adequate visualization of the IV ventricle, and the convenience of suturing the minimal arcuate incision in the dura mater reduces the risk of CSF leakage.

## Oncology

ePoster presentation

### Awake brain craniotomy vs. general anesthesia in brain tumor resection: systematic review and meta-analysis

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**Objectives:** To compare clinical outcomes and complications among patients with brain tumors who underwent either awake (AC) or general anesthesia (GA) craniotomy.

**Background:** AC has primarily replaced craniotomy under GA in brain tumor resection, allowing intraoperative brain mapping with the identification of functional areas and continuous assessment of different neurophysiological parameters. However, it has not yet been demonstrated that AC is superior to GA in every way.

**Methods:** We searched PubMed, Cochrane Central, Scopus, and Web of Science for relevant clinical trials and observational studies. Data were extracted from eligible studies and pooled as standardized mean difference (SMD), Mean Difference (MD), and Risk Ratio (RR) values in a meta-analysis model using RevMan 5.4.1.

**Results:** Ten Cohort Studies were included in this meta-analysis with 1877 patients. Our results showed that AC operation time (MD= -85.91; 95% CI [-172.62, 0.80], P= 0.05) and hospital stay (MD= -2.63; 95% CI [-4.54, -0.73], P= 0.007) were significantly more extended than GA. Furthermore, the AC group was superior to the GA group in terms of overall Karnofsky Performance Scale (KPS) score (SMD= -0.42; 95% CI [-1.34, 0.51]; P=0.38) and postoperative extent of resection (EOR) (SMD= 0.55; 95% CI [-0.14, 1.25]; P= 0.12). In terms of adverse events, the AC group was at higher risk of getting cognitive decline (RR 0.77; 95% CI [0.29, 2.09]; P= 0.61), seizures (RR 0.88; 95% CI [0.44, 1.75]; P= 0.71) and hematoma (RR 0.64; 95% CI [0.16, 2.57]; P= 0.52). On the other hand, the GA group reported a higher risk of the new onset of neurological deficits (RR 1.07; 95% CI [0.44, 2.62]; P= 0.88).

**Conclusions:** AC is considered more effective than GA in most perspectives. However, the incidence of postoperative complications may require further studies to determine if any underlying mechanism makes it higher in resections under AC.

## Hydrocephalus

ePoster presentation

An evaluation of UK reinfection rates and treatment regimens in hydrocephalus shunt infection

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**Objectives:** Assess the UK shunt reinfection rate and determine if it is associated with any treatment modalities such as antibiotic choice, delivery, and duration. Our secondary aim is to investigate linezolid as the ideal treatment antibiotic.

**Background:** Shunt insertion for hydrocephalus is one of the most common paediatric neurosurgery procedures worldwide, but there is no consensus on the ideal treatment of infection, which causes around 5% of shunts to fail. Furthermore, there is little research into the success rate of the treatment of infection, i.e. shunt reinfection rates.

**Methods:** A questionnaire was sent 37 neurological centres around the UK. Both consultants and trainees were asked to provide an audit or estimate of shunt reinfection rates, list their diagnostic criteria, and treatment regimens in shunt infection.

**Results:** Response rate was 65%, receiving 24 responses out of 37. We received 3 reinfection audits averaging 2.5% and 20 reinfection estimates averaging 4.5%. From this, we calculated the average shunt reinfection rate in the UK to be 4.2% (ranging from 2% to 15%). The most common treatment of shunt infection was shunt removal + EVD insertion. 83% neurosurgical centres used vancomycin in their treatment (43% used IV route, 39% intraventricularly). Only 21.7% responses used linezolid. The use of intraventricular antibiotics varied extremely from 1% to 100% of cases. The average duration of antibiotic treatment was 12.1 days, ranging from 7 - 24 days.

**Conclusions:** The questionnaire revealed that many neurological centres do not know their shunt reinfection rates, only providing estimates. We have additionally highlighted large differences in treatment between UK centres, indicating room for improvement in the prevention of shunt infections. There is a strong need for further research to determine the ideal treatment, particularly into the use intrathecal antibiotics and linezolid, which has shown success only on a case by case basis.



## Trauma

Oral presentation

### Role of D-dimer in structural disorder in mild traumatic brain injury

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**Objectives:** In this study, coagulopathy and abnormal fibrinolysis were investigated as blood biomarkers for detection of structural disorder in mild traumatic brain injury (TBI).

**Background:** Neuro imaging is integral part with traumatic brain injury (TBI), but the potential risks associated with ionizing radiation are unknown. Further, CT scans are not commonly available in developing countries.

**Methods:** A total of 200 patients with mild TBI (Glasgow Coma Scale [GCS] score 14–15) were admitted to tertiary center of Armed Forces between Sept 2019 and March 2022. Cases on oral antiplatelet agents and anticoagulants were excluded, 182 patients were included in this study. Patients were classified into those with (lesion [+]) and without (lesion [-]) intracranial structural disorder, based on CT scans at admission and follow-up CT.

Age, GCS score, and blood test findings (platelet count, international normalized ratio of prothrombin time [PT-INR], activated partial thromboplastin time [APTT], fibrinogen, fibrin/fibrinogen degradation products [FDP], and D-dimer) on admission were compared between the two groups. The length of hospital stay was also taken into consideration.

**Results:** The CT scan with presence of lesion and without any lesion groups comprised 112 (62%) and 70 patients (38%), respectively.

In multivariate logistic regression analysis, D-dimer (3.6 vs. 0.8  $\mu\text{g/mL}$ ) was the only significant independent risk factor for structural disorder ( $p < 0.001$ ). Platelet counts (23.9 vs.  $23.5 \times 10^4 /\mu\text{L}$ ), PT-INR (1.05 vs. 1.07), APTT (29.3 vs. 31.7 sec), FDP (12 vs. 2.4  $\mu\text{g/mL}$ ), and fibrinogen levels (260.6 vs. 231.3 mg/dL) were not associated with structural disorder. The higher the D-Dimer values, longer is the hospital stay.

**Conclusions:** These results show that D-dimer is associated with intracranial structural disorder in mild TBI. The cases with higher D-dimer with or without structural disorder required prolong hospital stay.

## Education, Ethics, Socioeconomic

Oral presentation

H index and other impact factors in neurosurgical publications - Is there a 'cost factor' that determines the quality?

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**Objectives:** We aim to compare the Journal's performance and its relationship to the submission fee incurred in publication. Here, we have investigated whether there is any impact of the cost incurred based on the article processing charges and subscription fee for personal usage to the quality of Journal's output based on the bibliometric indices.

**Background:** There has been an increase in number of Neurosurgical publications including open access approach over the recent years. We aim to compare the Journal's performance and its relationship to the submission fee incurred in publication.

**Methods:** We identified 53 journals issuing neurosurgical-related work. Quantitative analysis from various search engines involved obtaining H indices, journal citations indicators, and other journal's metrics such as immediacy index and 5-year impact factor utilising Journal Citation Reports from Clarivate software. Open access fees, coloured print costs, and individual subscription fees were collected. Correlations were produced using Spearman Rho ( $\rho$ ),  $p < 0.05$ .

**Results:** Median H indices for 53 journals is 54 (range: 0-292), with journal citation indicators median reported at 0.785 (range: 0-2.45). Median immediacy indices are 0.797 (range: 0-4.076) and the median for 5-year impact factor is 2.76 (range: 0-12.704). There is a very strong positive correlation between JCI and immediacy indices, JCI and 5-year impact factor and 5-year impact factor and immediacy indices ( $\rho > 0.7$ ,  $p < .05$ ). It is unclear whether there is any correlation between the indices and the OA costs and subscription costs for personal usage respectively ( $p > 0.05$ ).

**Conclusions:** Our analysis indicates that larger costs incurred for open access fees and subscription costs for personal use are not clearly reflected upon the journals' performance and this is quantified by utilising various indices. The potential full movement to OA exclusive journals would form a significant barrier for junior researchers, small institutions, or full time-trainee doctors with limited funding available.

## Education, Ethics, Socioeconomic

ePoster presentation

The era of web based learning & its impact on neurosurgical training

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**Objectives:** To evaluate the efficacy of the web-based learning methodology, recently promoted in keeping with the ongoing COVID-19 pandemic, through online courses, webinars and web conferences in neurosurgery.

**Background:** During the COVID-19 pandemic, a new platform of virtual education was recognized and was widely endorsed. The author, being a part of education and training committee and organizer of webinars, wished to evaluate the benefits of the virtual educational activity in order to assess the efficacy of this platform and to constitute future strategy.

**Methods:** In our study, we rotated a survey with the neurosurgery trainees and junior consultants 237 responses from 57% trainees and 43% junior consultant neurosurgeons were received from 80 different countries.

**Results:** 65.5% showed satisfaction with web-based learning method, 44.8% people claimed to attend 5-10 webinars/wk, 34.5% claimed to spend ~2hrs while 17.2% spent >5hrs, 40.7% agreed that web-based learning is better than book reading only, 51.7% agreed that web based learning enhanced their ward based clinical knowledge. There was a 100% agreement that web based learning augments their clinical experience. 84.6% agreed that web based learning should be continued as a part of neurosurgical training even after the pandemic is over.

**Conclusions:**

Based on our study, we conclude that the newly introduced and raging teaching methodology of web based learning is extremely effective and it should be integrated as a part of neurosurgery training even after the end of pandemic. We encourage this teaching methodology.

## Global Neurosurgery

Oral presentation

Neurosurgery research output in the Association of Southeast Asian Nations (ASEAN) region: a scientometric analysis

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**Objectives:** The objective of the study is to compare the publication trend, and topic trend on neurosurgery research in ASEAN region using scientometric techniques.

**Background:** Various challenges and innovations have led to the continuous evolution of neurosurgery in the ASEAN region. This development has resulted in increased interest among neurosurgeons to publish research papers for the past years. The purpose of this research is to compare the publication trend, and topic trend on neurosurgery research in ASEAN region using scientometric techniques.

**Methods:** This study systematically mined social sciences-related publications from Web of Science using the keywords “neurosurgery” OR “neurological surgery.” Results were further refined to only include English articles and review articles published by authors from ASEAN countries. Publication, citation, collaboration, and text-co-occurrence network analysis were done using Web of Science and VOSViewer.

**Results:** A total of 1951 articles published between 1996 to September 2022 were analyzed. The ASEAN countries' productivity are as follows: Singapore (34.07%), Thailand (21.66%), Indonesia (15.25%), Malaysia (14.72%), Philippines (5.99%), Vietnam (5.15%), Cambodia (1.78%), Myanmar (1.16%), and Brunei (0.21%). In terms of collaboration, institutions from Singapore, Thailand, Malaysia and Indonesia were the top neurosurgery research collaborators within the ASEAN region. In addition, neurosurgery publications in the ASEAN region have five clusters of co-occurring keywords which include (1) seizure, aneurysm, pain, recurrence; (2) traumatic brain injury, mortality, functional outcome; (3) technology, model, application, stimulation; (4) survey, training, cross-sectional; and (5) glioblastoma, brain metastases, chemotherapy, survival.

**Conclusions:** The trend in research publications supports the growing importance of neurosurgery in the ASEAN region. However, variations in publication patterns were seen, which can be attributed to the differences in the research interest, support, training, technology and culture among ASEAN countries. These are relevant in identifying future capacity-building projects, research agendas, and policy guidelines, and collaborative projective between countries, and improve research production in the region.

## Spine

Oral presentation

Comparative analysis of kyphotic-deformity correction and implant-failure in thoracolumbar fractures management with percutaneous long-segment versus short-segment pedicle screws fixation

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**Objectives:** To compare correction of kyphotic deformity and implant failure in Percutaneous Long-Segment Pedicle Screws Fixation versus Short-Segment Pedicle Screws Fixation with Incorporated Screws at the Level of Fracture.

**Background:** Most traumatic thoracolumbar fractures occur at the thoracolumbar junction (T11-L2). Despite this pathology's high incidence, there are currently no evidence-based guidelines for the right approach and instrumentation techniques. Several surgical techniques and approaches are available for the treatment of thoracolumbar fractures which includes posterior, anterior, open, minimally invasive, and combined posterior-anterior ones. However, which levels should be instrumented to achieve a successful recovery is an essential question in the decision-making process. The application of short-segment or long-segment pedicle screw fixation is still under debate.

**Methods:** A prospective study included 95 patients, from June 2020 to July 2022 fulfilling the inclusion criteria with Cobb's angle  $\leq 25^\circ$  were added from the Department of Neurosurgery, Punjab Institute Of Neuroscience. The patients were divided into two groups 46 patients were included in percutaneous Long-Segment Pedicle Screws Fixation (group A) while 49 patients were included in Short-Segment Pedicle Screws Fixation with Incorporated Screws at the Level of Fracture (group B). The pre-operative, post-operative, and follow-up radiographs were evaluated. The quantitative variables like kyphotic angle and implant stability were analyzed.

**Results:** 49 patients (51.57%) had short-segment and 46 (48.42%) had long-segment fixation. In the short-segment group, the pre-operative mean Cobb's angle was  $22.91^\circ \pm 3.97^\circ$  and the angle of correction was  $10.14^\circ \pm 1.9^\circ$  after 6 months, while in the long-segment group, the pre-operative mean Cobb's angle was  $20.08^\circ \pm 4.0^\circ$  and the angle of correction was  $9.62^\circ \pm 2.59^\circ$ . Regarding implant failure, there was no case in the short-segment group and long-segment group.

**Conclusions:** Short-segment fixation can maintain the angle of correction as a long-segment fixation for single-level thoracolumbar traumatic fracture with good stability in terms of implant failure.

## Skull Base

ePoster presentation

Outcome and incidence of CSF rhinorrhea after transsphenoidal surgery: our experience

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**Objectives:** To determine the incidence of CSF rhinorrhea after transsphenoidal surgery in our region in order to prevent patients from having to redo surgery and developing recurrent meningitis, as well as to reduce patient morbidity.

**Background:** Cerebrospinal fluid (CSF) leakage is a common complication after neurosurgical intervention. It is associated with substantial morbidity and increased healthcare costs. Transsphenoidal surgery remains the mainstay of therapeutic and diagnostic treatment for many types of skull base lesions because it has a very high rate of success and less morbidity. Transsphenoidal surgery is safe and effective for removing pituitary tumors.

**Methods:** The study included 116 patients, with a demographic age range of 25–60 years for both males and females. All the patients underwent transsphenoidal excision of the lesion and were followed for 24 hours, 1 week, and 1 month. Patients were examined for CSF rhinorrhea.

**Results:** Mean age was  $45.23 \pm 8.71$  years. Out of 116 patients, 52 were male and 64 were female. 44.82%, 55.13% respectively. Incident of different type of tumors were 58.9 sellar and 41.1 were suprasellar. CSF rhinorrhea was found in 6 out of 116 (6.96%).

**Conclusions:** In our population, the incidence of CSF rhinorrhea after transsphenoidal surgery is 6.96%.

## Neurovascular Surgery

Oral presentation

Treatment of late stage Moya Moya disease

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**Objectives:** Role of EDAMS(encephalo-duro-arterio-myo synangiosis) in late stage moya moya disease.

**Background:** Late stage moya moya disease is defined as stage 5 and 6 of Suzuki's grade moya moya disease. Despite spontaneous collaterals from branches of external carotid artery, cerebral revascularization is necessary in most of the patients.

But the already-formed collaterals are very variable. And that makes revascularisation difficult. Individualized revascularization seems to be an effective solution.

**Methods:** We did 30 cases of EDAMS for late stage moya moya disease depending on cerebral blood flow study. Scalp flap, muscle flap, bone flap, dural flap depends of cerebral blood flow study -- targetted and individualised.

**Results:** 98 % cases showed excellent result clinically and in blood flow study.

**Conclusions:** Targeted-individualized revascularization is proved to be safe and effective in our single institution case series of 30 cases of late stage moya moya disease.

## Oncology

ePoster presentation

Near-total surgical resection of a cerebello-pontine angle vestibular schwannoma followed by stereotactic radiosurgery (SRS) - Paradigm shift for patient-friendly neurosurgery

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**Objectives:** To evaluate the efficacy and safety of near-total resection of cerebello-pontine angle vestibular schwannoma followed by SRS (Stereotactic radiosurgery).

**Background:** The management of large cerebello-pontine angle tumors remains a formidable challenge. In such large tumors, radical surgical extirpation offers a significantly higher risk of neurological deficit, and SRS alone cannot be used because of the elevated incidence of radiation-induced complications known to be associated with large-volume tumors. With increasing treatment volumes, SRS-associated tumor control rates decrease and complication rates increase.

Planned near-total resection (NTR) with adjuvant SRS has gained increasing interest in recent years as a multimodal approach. In NTR (aimed at decreasing surgical morbidity) followed by SRS to a preplanned residual tumor aids in harnessing advantages offered by both approaches. Although intuitive and reasonable, this paradigm shift from maximal resection at all cost has not been adopted widely. Combining open microsurgery with SRS requires a good understanding of both surgical and SRS modalities and their respective safety–efficacy features.

**Methods:** We present 140 cases of cerebello-pontine angle vestibular schwannoma which was treated by near-total intracapsular maximal debulking through retromastoid approach followed by stereotactic radiosurgery(SRS) over last 7 years(2012 to 2019).

Right retro-mastoid craniectomy and near-total removal of tumor with facial nerve monitoring followed by MRI brain (contrast) at 3 months and followed by SRS (stereo-tactic radiosurgery).

**Results:** Anatomical facial nerve preservation was 100%, functional preservation was 98%. There was no lower cranial nerve palsy and no brain stem dysfunction, high tumor control rate and favorable clinical outcome (preservation of neurological function and quality of life).

**Conclusions:** Near-total resection of cerebello-pontine angle vestibular schwannoma followed by stereotactic radiosurgery gives excellent clinical outcome and tumor control for recurrence.



## Spine

ePoster presentation

### The causal role of spinal cord pulsation in the development of syringomyelia

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**Objectives:** We conducted this study to investigate the phenomenon of the absence of an obstruction of the cranial-to-spinal CSF flow in patients with syringomyelia and tethered cord syndrome. We included not only patients with primary tethered cord syndrome but also patients with (posttraumatic or postoperative) secondary tethered cord syndrome.

**Background:** Current theories on the causes of syringomyelia have only one aspect in common, namely that syringomyelia results from cerebrospinal fluid (CSF) flow obstruction in all diseases associated with syringomyelia. Tethered cord syndrome is known to cause syringomyelia also in the absence of an obstruction to cranial-to-spinal CSF flow.

**Methods:** A total of 877 patients with syringomyelia underwent cardiac-gated phase-contrast magnetic resonance imaging (MRI) of CSF flow pulsation at our institution. Of these, 35 patients presented with primary tethered cord syndrome, 58 with posttraumatic syringomyelia, and 21 with postoperative syringomyelia. Sixty-four patients (56%) did not undergo surgical treatment for various reasons.

**Results:** In patients with tethered cord syndrome and a low-lying conus, however, relevant pulsations were also detected in the lumbar subarachnoid space similar to the pulsations seen in the region of the lower thoracic spine in patients without a low-lying conus. Particularly important information on the aetiology of syringomyelia was obtained from a patient with posttraumatic syringomyelia and an untreated fracture-dislocation with a complete blockage of the spinal canal and thus with a complete obstruction of CSF flow. He developed marked syringomyelia in the region of the thoracic spine in spite of the complete absence of pulsation cranial to the syrinx. A decrease in syrinx cavity size after an untethering procedure in primary tethered cord syndrome is evidence of a causal role.

**Conclusions:** Apart from brain pulsation, spinal cord pulsation decisively contributes to the development of syringomyelia in some groups of patients. Cranial pulsation appears to play a less important role in these cases.

## Skull Base

Oral presentation

### Brainstem lesions - breaking the impenetrable fortress

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**Objectives:** The authors of the present study examine an infratrigeminal suprafloccular approach, which has proven as a safe surgical route, producing fewer post-operative complications.

**Background:** Brainstem lesions are notorious for their complexity and microsurgical access to these lesions remains a challenge in neurosurgery.

**Methods:** A lateral pontine approach was assessed for safe access. Transoperative findings were compared with those of brainstem specimens, and the mean entry point in the lateral aspect of the pons was systematically measured, attempting to demonstrate a safe zone.

**Results:** The authors have consistently analyzed twenty brainstem specimens, with special attention to the pontine microsurgical anatomy, and measured three distinct lines, which were named X, Y and Z, in conformation of a triangle in shape. The mean measurement of X in the studied specimens was 14,41mm (ranging from 10 to 20mm); of Y was 13,1mm (with a measured range from 10 to 21mm); and of Z was of 3mm (ranging from 2 to 5mm), producing a mean surface area of 20,1mm<sup>2</sup> in the analyzed specimens (ranging from 10mm<sup>2</sup> to 40mm<sup>2</sup>). The triangular shaped surface in the lateral aspect of the pons, formed by X, Y and Z, was depicted as a safe zone of entry in the lateral aspect of the pons, for microsurgical approach to intrapontine lesions, with less retraction pontine structures. We have consistently assessed the microsurgical anatomical findings, with those of intraoperative monitoring, and found that this entry point have consistently been predictive of less functional instability of the tracts analyzed, with fewer postoperative complications.

**Conclusions:** Deep seated pontine lesions are a complex array of distinct pathologies, with a great potential of devastating outcomes. The present study has identified and described a presumed safe zone, through which a surgical corridor may be created in order to biopsy or micro-surgically resect these lesions, in a previously stated impenetrable region.

## Education, Ethics, Socioeconomic

ePoster presentation

Global mentorship in neurosurgery for medical students study (the GloMNMS Study): a multinational cross-sectional audit

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**Objectives:** The objective of this study is to assess the perception of global mentorship in neurosurgery across medical students' community. We also aimed to investigate the factors affecting the availability and draw conclusions on benefits of having a global mentorship scheme in neurosurgery at a medical student level.

**Background:** To assess the perception of global mentorship in neurosurgery amongst medical students across the world. Secondary aim included investigating the factors affecting the availability and benefits of providing global mentorship scheme in neurosurgery at a medical student level.

**Methods:** The Global Mentorship in Neurosurgery for Medical Students Study (GloMNMS) was a multinational cross-sectional audit including medical students years 1-6 and intercalating programmes. They were invited to complete an online survey between 11th March-1st May 2022. The survey was disseminated to 243 medical university ambassadors worldwide from 60 countries who distributed the survey within their respective medical student cohorts across the duration of the study.

**Results:** Overall, 2962/3017 (98.2%) responses from medical students from 60 countries worldwide were included. 1712, 1502 and 1359 of responses gathered indicated that possible reasons for the lack of neurosurgical mentorship are lack of time and resources from trainees in Neurosurgery, time within medical school's curriculum and awareness of societies in Neurosurgery/Neurology. 1276 and 1065 of medical students surveyed reported that it could also be due to lack of funding and inaccessibility within the area meaning there are few networking opportunities available.

**Conclusions:** This pilot study indicates that there is a scope for improvement regarding the availability and accessibility of neurosurgical mentorship programmes worldwide at a medical student level. The evaluation suggested that medical students would most benefit from the neurosurgical mentorship in the future by increasing the number of mentors within their universities, accessibility to neurosurgical departments and the ability to choose mentorship globally via a unified digital platform.

## Education, Ethics, Socioeconomic

Oral presentation

Early and late decompressive craniectomies versus standard medical management in traumatic brain injury patients with refractory intracranial hypertension: meta-analysis study

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**Objectives:** The meta-analysis explored the effectiveness of early and late decompressive craniectomies (DC) in contrast to medical management in patients with refractory intracranial hypertension after sustaining traumatic brain injury (TBI).

**Background:** The clinical outcomes analysed in this study were grouped into 2 categories; favourable (good recovery and moderate disability) and unfavourable outcomes (death, vegetative state, and severe disability). Another variable analysed in this study was intracranial pressure that has been measured post-randomisation in the studies included.

**Methods:** Google Scholar, Cochrane and Medline search engines were utilised for data collection with the timeline set between 1999 until present. The searched keywords included the following: decompressive craniectomy, refractory intracranial hypertension, medical management, and traumatic brain injury. Thereafter, the data was uploaded to Review Manager for statistical analysis.

**Results:** Of the 122 articles, 10 randomized controlled trials (RCT) were included in the meta-analysis. The analysis yielded that relative risk (RR) of overall mortality in decompressive craniectomy group vs medical management is 0.58 95% CI [0.41, 0.81] (P = 0.001). The standardised mean difference (SMD) for intracranial pressure is -2.59 95% CI [-3.72, -1.46] (P < 0.00001) between the two groups. The odds ratio considering favourable outcomes (Glasgow Outcome Scale) for patients undergoing surgery vs medical care is 1.02 95% [0.57, 1.82] (P = 0.95).

**Conclusions:** This meta-analysis demonstrates that decompressive craniectomy significantly reduces the overall mortality and intracranial pressure in patients with TBI and refractory intracranial hypertension in comparison to the medical management. However, no significance was reached in terms of the favourable outcomes between the two interventions. Decompressive craniectomy has a greater potential to treat TBI patients with refractory intracranial hypertension than medical care alone however more randomised clinical trials are needed to ascertain the effectiveness of the superiority of these treatments in the future research.

## Oncology

ePoster presentation

### CNS cryptococcoma in an immunocompetent adult from a low resource setting: a case report

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**Objectives:** We present a case of CNS cryptococcoma in an immunocompetent patient and review literature to illustrate diagnosis and treatment of such lesions.

**Background:** Cryptococcal infection in the Central Nervous System (CNS) is frequently seen in human immunodeficiency virus (HIV) patients and others with low immunity as an opportunistic fungal infection. However, CNS cryptococcal granuloma (cryptococcoma) in immunocompetent patients is rare. We present a case of CNS cryptococcoma in an immunocompetent patient and review literature to illustrate diagnosis and treatment of such lesions.

**Methods:** A 62-year-old, HIV negative, immunocompetent female patient with no known chronic illness, presented with 5 months history of a progressive headache, associated with on and off episodic generalized tonic clonic convulsions. She had been to several hospitals before she was referred to our center with a diagnosis of a brain tumor. Before referral and despite a negative CSF analysis result, she had received treatment for bacterial meningitis with no success.

At Mbarara Regional Referral Hospital (MRRH), she had surgery with complete excision biopsy which showed features consistent with cryptococcosis on histology. The patient had a successful adjuvant treatment with antifungal drugs following surgery.

**Results:** At Mbarara Regional Referral Hospital (MRRH), she had surgery with excision biopsy which showed features consistent with cryptococcosis on histology. The patient had a successful adjuvant treatment with antifungal drugs following surgery.

**Conclusions:** The diagnosis of a parasitic CNS infection, particularly cryptococcal infection mimicking neoplastic lesion in immunocompetent patient, was unusual. Surgical management of such lesions from different reports have a bad outcome and management remains totally conservative. However, our case had a successful surgical and medical treatment.

## Spine

Oral presentation

Comparative study on long-term outcomes of conventional open versus minimally invasive posterior interbody fusion surgery: a meta-analysis

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**Objectives:** The objectives were to compare the long-term pain control and functional outcome of patients who underwent conventional open versus minimally invasive posterior lumbar interbody fusion surgery; to determine the rate of long-term complications, and to describe the cost-effectiveness of both approaches.

**Background:** Lumbar interbody fusions are designed to structurally remove pathologic disks to replace it with an interbody spacer. Recent interests in minimally invasive surgeries (MIS) and its short-term advantages have led to a paradigm shift towards minimally invasive posterior approaches. Evidence of long-term advantages, however, has been lacking. This review compares long-term outcomes of conventional open versus minimally invasive posterior lumbar interbody fusion.

**Methods:** Literature search was done in the PubMed gateway of the MEDLINE database and Google Scholar. Outcome measures include long-term pain and functional outcome scores, complication incidences, and total treatment costs. Review Manager 5.4 was used for data analysis.

**Results:** Ten articles were included for analysis. There were no significant differences in the overall visual analog scale (VAS) scores between minimally invasive surgery (MIS) and open surgery (OS). Subgroup analysis of the back and leg pain and functional outcomes also failed to demonstrate a significant difference between the groups. The incidence of long-term complications was significantly lower in the MIS group, with an overall risk ratio of 0.59, 95% CI [0.37, 0.94]. Subgroup analysis also showed significantly lower incidence of adjacent segment pathology (ASP) in the MIS group (Risk ratio 0.47, 95% CI [0.25, 0.87]). However, the two groups had no significant difference in revision surgery. Lastly, no significant difference was demonstrated in the total costs between the two groups.

**Conclusions:** The long-term pain, functional, and cost outcomes of conventional OS and MIS posterior lumbar interbody fusion surgery are comparable. However, there is a lower overall complication rate, specifically ASP, in patients undergoing minimally invasive posterior lumbar interbody fusion surgery.

## Paediatric

ePoster presentation

Revised predictive scoring system for postresection hydrocephalus in pediatric patients with posterior fossa tumor and the role of AI

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**Objectives:** To identify the significant predictive factors for post-resection hydrocephalus in pediatric patients with posterior cranial fossa tumors and propose a scoring system. To consider the application of AI in prediction of post-resection hydrocephalus study has three main parts. We wish to modify and suggest a score which take into account objective findings. We wish to add variables that can allow application of AI. Since I personally believe we should start from simple approach which we usually overlook and has deep meanings in real, we also suggest comprehensive doctor notes with relevant points to predict post-resection hydrocephalus. It will minimise risk of missing important information regarding prediction of post-res HCP

**Background:** While the majority of patients with PCF tumors have hydrocephalus, in 70 % HCP resolves after resection and post-resection hydrocephalus is observed in approximately 30% of pediatric patients with posterior fossa tumors. However, who will suffer from persistent hydrocephalus remains a question of concern. In this paper we have attempted to modify and add a few more points in the scoring system. Additionally, we have tried to design it in a way to make this scoring system readable by AI.

**Methods:** Retrospective chart review of 109 pediatric patients with a PCF tumor resection was performed and notable predictive factors identified in patients who developed postresection HCP. Biostatistical analysis performed. Furthermore, literature review was performed.

**Results:** Our results showed several significant predicting factors including

- Younger age (2-4yrs),
- Midline tumors,
- Tumors with superior extension,
- Venous sinus compression,
- Increased intraoperative bleeding,
- Subtotal tumor resection,
- Intraventricular blood,
- Wound CSF leak,
- Pseudomeningocele,
- Postoperative meningitis.

**Conclusions:** New Predictive Scoring System is required for the accurate prediction of hydrocephalus in pediatric patients operated for posterior fossa tumors. Such schematic approach can also be used to train AI which will be able to help in stratifying risk.

## Oncology

ePoster presentation

Does simpson grade for meningioma still holds in present era

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**Objectives:** To study the epidemiology of meningioma, their symptomatology & clinical presentation. To study outcome of meningioma after surgery based on location & extent of resection.

**Background:** Meningiomas are benign tumor arising from Arachnoid cap cells. Meningiomas constitute 21% of primary brain tumor when post-mortem data are excluded. However, if postmortem data are included Meningioma are the most common primary brain tumor. Currently, WHO classify meningioma in three grades based on - mitotic rate, cellular features of atypia, and local invasion. Grade I meningiomas are most common among all grades.

**Methods:** It was a retrospective study. All meningioma patients operated at our hospital between Jan 2015 & Dec 2019 were included in this study. Patients with meningioma who were managed conservatively/underwent Gamma knife were excluded. Incidentally detected meningioma patients with tumor size <2.5cm were excluded from our study. The age group was between 15-80 years.

**Results:** Total cases operated were 50. The peak incidence is in the sixth to seventh decades. Total no. of males was 17 and females was 33. Most common location was convexity followed by parasagittal. Most common mode of presentation was headache followed by weakness of limbs. Most of convexity meningioma underwent Simpson grade 0 (96%). Simpson grade 1 in 16 (32%), Simpson grade II in 32(64%), Simpson grade IV in 2 (4%).

Almost 96% of our cohort had WHO grade I meningioma, 4% had grade II meningioma.

Patients with grade II meningioma in whom we could not achieve GTR were given radiotherapy postoperatively. Most common type resected was transitional meningioma constituting 40% of cases. 2 patients died due to systemic illness. One patient had increased weakness post operatively. Recurrence of lesion was seen in 2 cases.

**Conclusions:** So far, our results were comparable to available literature. We found slightly higher incidence of posterior fossae meningioma in our study.



## Oncology

ePoster presentation

Machine learning-based neurosurgery: artificial intelligent approaches. New era begins

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**Objectives:** The machine learning algorithms are able to learn with experiences, perform big data analysis, and fulfill human-like tasks. Intracranial surgical approaches that have been defined, disciplined, and developed in the last century have become more effective with technological developments. We defined individual-safe, intracranial approaches by introducing functional anatomical structures and pathological areas to artificial intelligence.

**Background:** Preoperative MR images of patients with deeply located brain tumors were used for planning. Intracranial arteries, veins, and neural tracts are listed and numbered. Voxel values of these selected regions in cranial MR sequences were extracted and labeled.

**Methods:** Q-learning algorithm which is a model-free reinforcement learning algorithm was run on labeled voxel values (on optimal paths extracted from the new heuristic-based path planning algorithm), then the algorithm was assigned to list the cortico-tumoral pathways that aim to remove the maximum tumor tissue and in the meantime that functional anatomical tissues will be least affected.

**Results:** The most suitable cranial entry areas were found with the artificial intelligence algorithm. Cortico-tumoral pathways were revealed using Q-learning from these optimal points.

**Conclusions:** AI will make a significant contribution to the positive outcomes as its use in both preoperative surgical planning and intraoperative technique equipment assisted neurosurgery, its use increased.

## Oncology

ePoster presentation

The use of prophylactic antiepileptic medication (pAED) and driving restrictions for craniotomies among Australian and New Zealand neurosurgeons

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**Objectives:** To survey Australasian surgeons uses of anticonvulsants and driving restriction recommendations for craniotomies.

To review the literature regarding anticonvulsants and craniotomies.

To review the literature regarding craniotomies and driving.

**Background:** pAED use for craniotomy surgery is currently not supported in literature (1-5) except possibly in traumatic brain injury (TBI) (6). Post craniotomy driving restrictions using the Austroad guidelines are based upon literature on TBI and not specifically craniotomy (7-9). This study was to review Australian and New Zealand neurosurgeons on their use of pAED and advice on driving restrictions post craniotomy surgery.

**Methods:** A voluntary and anonymous survey link was distributed to the members of the Neurosurgical Society of Australasia (NSA) through the NSA newsletter. The survey was available on the SurveyMonkey platform in the year 2021 August to December. Questions regarding the use of pAED and duration of driving restrictions were presented to survey participants.

**Results:** Sixty-one (26%) out of 231 neurosurgeons responded to the survey. Thirty-six percent of respondents stated that they prescribed pAEDs regularly whilst thirty-two percent of respondents did not routinely prescribe pAEDs for craniotomy surgery. The most common driving restriction post craniotomy surgery was 6 months which is in concordance to the Austroad guidelines.

**Conclusions:** There were divided opinions among NSA members in regards to pAED use and driving restrictions. The rationale for pAED use and prolonged driving restrictions for craniotomy surgery needs to be re-evaluated with current literature. The significant effect altering this may have on the improved well-being and quality life of patients needs to be considered.

## Trauma

ePoster presentation

### Reducing chronic subdural hematoma relapse rate by endovascular liquid embolization of Middle Meningeal Artery

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**Objectives:** The technical specifics of endovascular liquid embolization of middle meningeal artery (MMA) distal branches to reduce the relapse rate of chronic subdural hematoma (cSDH) are addressed. The postprocedural results and outcomes were discussed and compared to the literature findings.

**Background:** Relapse after surgical evacuation of cSDH is rather common, especially in elderly patients suffering from various health risks, including coagulopathies requesting protracted therapy with blood thinners. Such a relapse is primarily originated from frequent micro bleeding of the hematoma external membrane, which is supplied by MMA distal branches. Hence, their endovascular embolization may instigate hematoma step-by-step fading, decreasing its recurrence rate in selected patients.

**Methods:** An institutional case series of selected cSDH patients in whom MMA endovascular liquid embolization was applied during a one-year period (January to December 2022) was retrospectively analyzed. The investigated features were: patients' gender and age; initial and follow-up neurological condition; mode of cSDH treatment; comorbidity; postprocedural complications; and hematoma relapse.

**Results:** Ten non-symptomatic cSDH elderly patients ( $\geq 60$  years old) were treated with super-selective endovascular embolization of MMA distal branches using a non-adhesive liquid embolic agent (2 mL Squid). At a 3-month follow-up, they were all completely recovered, without postprocedural complications and hematoma recurrence detected on radiologic (CT) screenings.

**Conclusions:** Endovascular liquid embolization of distal MMA branches is an inoffensive interventional procedure for cSDH treatment with low recurrence, morbidity, and mortality. It is particularly effective in selected elderly patients to reduce relapse rates as an alternative or adjacent method to the surgery.

## Spine

ePoster presentation

### Dural sealants in spine surgery: a scientometric analysis

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**Objectives:** This research specifically aims to systematically and comprehensively evaluate the publication, citation, collaboration, and evolution of topics in dural sealant for cerebrospinal fluid leakage prevention after spine surgery.

**Background:** Since, Cerebrospinal fluid (CSF) leakage is one of the most difficult post-operative complications after spinal surgery which can result in a myriad of complications that can potentially result in a prolonged hospital stay, higher incidence of reoperation, and an overall decline in prognosis, treatment is imperative.

**Methods:** The study systematically mined publications from Web of Science last January 2023 using keywords (dural sealant) AND (cerebrospinal fluid) AND (spine surgery). No exclusion criteria was used. The analysis was divided into publication, citation, collaboration, and text-co-occurrence network analysis. R studio and VOSViewer were used for data management, analysis and visualization.

**Results:** 53 documents published between 2002 to 2022 were analyzed. The top countries with publications were: United States of America (39.62%), Italy (9.43%) and Japan (9.43%). Citations for all publications were 859 with an H-index of 15. Neurosurgery publications had four clusters of co-occurring keywords including:

- (1) neurological deficit, polyethylene glycol, efficacy;
- (2) dural defect, prevention, CSF leak;
- (3) postoperative CSF leak, dural tear;
- (4) leakage, fibrin sealant, watertight closure.

In terms of evolution, publications focused initially on the types of sealants but are now more focused on the effects and outcomes.

**Conclusions:** This study provided an overview of the output, trend and topics in the field of dural sealants for CSF leakage for spine surgery publications worldwide. Although the number of publications and citations are promising, there is still a need for more research using varied designs and subjects about this topic. The results serve as a guide for researchers, practitioners, and educators to find the future direction of research agenda and projects about the use of dural sealants for prevention of CSF leak.

## Global Neurosurgery

Oral presentation

Evaluation of serial serum S100 $\beta$  protein in identification, progression, and outcome evaluation in patients with intra cerebral hemorrhage

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### Objectives:

1. To check if ICH patients can accurately be diagnosed by S100 $\beta$ .
2. To determine changes in serum S100 $\beta$  levels with radiological and clinical outcome.

**Background:** There has been an increasing research trend in search of the clinical utility of neurochemical biomarkers in stroke. S100 $\beta$  is a calcium binding protein which is found abundantly in astrocytes and many other tissues. In this study we have evaluated serum S100 $\beta$  protein levels to determine its role in assessment of hematoma, brain injury progression and clinical outcomes in adult patients with Intra Cerebral Hemorrhage in western India. This was the first Asian study to determine the correlation and progression changes in serum S100 $\beta$  levels with changes in the patient's radiological and clinical outcome.

**Methods:** This study was a single centre, prospective and observational study. In total 87 patients were enrolled in which 47 were adult patients with CT-proven intracerebral hemorrhage and 40 were healthy individuals. Blood samples were collected on admission and consecutive 2 days. In this study serum S100 $\beta$  levels were determined using Roche ECLIA S100 test kit.

**Results:** Patients with ICH had significantly higher serum S100 $\beta$  levels as compared to the controls ( $p < 0.05$ ). There was a significant positive correlation of S100 $\beta$  level at time of 1st and 2nd sample collection, with CT volume. Patients with clot volume  $> 20$  cc had significantly higher S100 $\beta$  value. There was a significant correlation in S100 $\beta$  levels when classified according to the outcome. Trend analysis showed drop in S100 $\beta$  levels after treatment.

**Conclusions:** The findings of this study demonstrate that S100 $\beta$  protein appears to be a potential biomarker for assessment of the intra cerebral haemorrhage and evaluating the radiological outcome for patients with the hematoma volume  $> 20$ cc. The study also demonstrates that S100 $\beta$  protein is a relevant biomarker in predicting the clinical outcomes.

## Neurovascular Surgery

Oral presentation

A proposed hemodynamic classification of arteriovenous malformations and role in the stratification of rupture risk

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**Objectives:** Our aim is to determine if the hemodynamic classification of arteriovenous malformations (AVMs) is a risk factor for cerebral hemorrhage.

**Background:** Treatment of brain AVMs remains controversial. A new classification regarding the future risk of rupture is needed in order to estimate the risk of hemorrhage and help in the treatment decision-making. We propose a new hemodynamic classification of AVMs as a risk stratification for rupture.

**Methods:** Angiograms of brain AVMs diagnosed in our center between January 2010 and December 2019 are retrospectively reviewed. The proposed hemodynamic classification divided AVMs into low, medium or high risk of bleeding, taking into account blood flow velocity and angioarchitecture of the AVM. The patients were divided into those who presented with cerebral hemorrhage and those who did not, and through a multivariate analysis it was analyzed whether this hemodynamic classification could be related to the risk of bleeding, correcting for other traditionally known risk factors.

**Results:** 73 patients were analyzed. 20 patients were excluded and 52 were included in the analysis (42% women, 58% men) with a mean age of 40 years. 59% belonged to the "bleeding" group and 41% to the "no bleeding" group. Prevalence of bleeding varied between groups: 33% at low risk, 56% at medium risk, and 85% at high risk. In the multivariate analysis, this classification was a predictor of rupture risk ( $p=0.02$ ). Size  $> 3$ cm ( $p=0.09$ ) and associated aneurysms ( $p=0.08$ ) showed a tendency towards a higher bleeding risk. The presence of arterial afferents from a single territory of the circle of Willis ( $p=0.03$ ) was also an independent risk factor for bleeding.

**Conclusions:** The present hemodynamic classification of AVMs could stratify the risk of rupture, as an independent factor. Larger AVM size and presence of aneurysms are related to a higher bleeding risk. Single-territorial arterial feeders were an independent factor of risk.

## Skull Base

ePoster presentation

Video-case of teratoma in the pineal region in an adult

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### Objectives:

- Showing the infratentorial supracerebellar approach as a secure approach to completely remove a pineal gland tumor.
- Complete removal of the tumor can avoid necessity of cerebrospinal fluid (CSF) valve systems.

**Background:** Pineal gland tumors are a rare entity in adults. The most common group are germ cells tumors, being the germinoma the most prevalent subtype followed by the teratoma. They are most prevalent in males and they can metastasize through the CSF system. Their prognosis depends on the tumor's total resection and the degree of response to chemotherapy and radiotherapy.

**Methods:** We present a video-case of a 37 years-old male, without history of interest, who starts with headache and left eye vertical diplopia of 15 days of evolution. After brain MRI, we note a contrast enhancer injury in the pineal region, that causes obstructive triventricular hydrocephalus, requiring urgent external ventricular drainage. We complete the extension study with a neuroaxis MRI, thoracoabdominopelvic CT and blood and CSF tumor markers, being all negative.

**Results:** We realize open approach in semisitted position. Intraoperative neurophysiological monitoring. Bilateral suboccipital craniotomy and infratentorial supracerebellar approach to the pineal region. We observe a pink coloured heterogeneous injury, with cystic areas and calcium, that can be completely removed.

After surgery, the patient has transient bilateral vertical diplopia due to III pair bilateral palsy, that resolved after rehabilitation, without other focality. Control brain MRI that shows complete removal of the tumor and absence of hydrocephalus signs, so external ventricular drainage is removed. Pathology study demonstrate a benign teratoma with negative postoperative blood and CSF tumor markers.

**Conclusions:** Pineal gland teratomas are a surgical challenge. The infratentorial supracerebellar open approach allows their complete and secure removal, resolving the obstructive hydrocephalus and avoiding CSF valve systems.

## Oncology

ePoster presentation

### Management of multiple brain metastasis from primary rectal cancer: case report

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#### **Objectives:**

Present a clinical case in which the surgical management of multiple colorectal cancer metastases conditioned an increase in the patient's survival and quality of life despite the unfavorable prognosis implied by the diagnosis.

#### **Background:**

Colorectal cancer is among the most prevalent malignancies worldwide, with a very low incidence of brain metastases (0.6 - 9%) in advanced stages of the disease, associated with unidentified lung metastases and a poor prognosis with a median overall survival of around 5 months and a poor quality of life. Treatment methods include surgery, radiotherapy and chemotherapy, and increased survival rates have been observed by combining different therapeutic options.

#### **Methods:**

A 53-year-old patient with diagnosis of rectal cancer was initially treated using the Hartmann procedure, chemoradiotherapy followed by lower abdominal resection and ileostomy, remaining disease-free for 13 months until pulmonary recurrence requiring metastasectomy, 6 months later she had two episodes of seizures, physical examination revealed paresthesia in the right thoracic limb and agraphesthesia, contrasted tomography of the skull that evidenced multiple extra-axial lesions with ring enhancement located at the level of both cerebellar hemispheres, left frontal and parietal lobe, as well as in the lobe right frontal, magnetic resonance imaging contrasted with perilesional edema associated with the right parietal lesion, a surgical approach was performed to the left parietal lesion and the right frontal lesion, achieving total excision of both lesions.

**Results:** In the postoperative period with paresthesias of the right thoracic limb, agraphesthesia, tomography showing total excision of the left and right frontal parietal lesion, histopathological report of colorectal adenocarcinoma metastasis, adjuvant radiotherapy is provided with 150 days of survival to date.

**Conclusions:** Despite the poor prognosis, surgical treatment associated with radiotherapy or chemotherapy can limit the progression or appearance of neurological deficits with improved quality of life and increased survival.



## Neurovascular Surgery

Oral presentation

Measurement and comparison of handmade vascular clips versus standard commercial clips

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**Objectives:** The main objective was to measure the closing force of the vascular handmade clip (Nathal's clip) and compare it against standard commercial clips for use in experimental microsurgery or low-flow bypass surgeries.

**Background:** In vascular neurosurgery, we use different types of clips to occlude blood flow temporarily. We developed a handmade vascular clip for use in cerebral low-flow bypass procedures. However, it is of utmost importance to know the clip characteristics (materials, closing force) before considering the use in surgical procedures.

**Methods:** Prospective, comparative, transversal, observational study using an electronic system to measure the closing force of vascular clips. The handmade vascular clips (Nathal) are fabricated by the senior author (material and process of fabrication has been described in a previous paper). The closing force of these clips was measured and compared with standard Yasargil permanent, temporal, fenestrated and Heifetz (titanium and plastic) clips. A descriptive, inferential statistical analysis was made considering a p value <0.05 significant.

**Results:** Sixteen vascular clips were measured. 12 standard commercial and 4 handmade. Of the commercial clips 50% were permanent and 50% temporary. Mean closing force of handmade clips was  $0.85 \pm 0.33$  N, commercial permanent was  $1.14 \pm 0.60$  N and commercial temporal was  $1.0 \pm 0.63$  N ( $p=0.348$  and  $p=0.356$ , t de Student). The size of the commercial clips was  $1.8 \pm 0.4$  cm and handmade was  $2.0 \pm 0.0$  cm. When used in an experimental environment, they had an effective closing force and easy management.

**Conclusions:** Closing force of the handmade clips is lower than commercial (temporal and permanent) clips, which in bypass procedures is beneficial due to less possibility of vascular injury. In this way, more research is needed to assess safety for widespread use in neurovascular surgery, however they can be of great benefit and very low cost for these procedures.

## Paediatric

ePoster presentation

### Intracranial migration of a ventriculoperitoneal shunt: case report and literature review

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**Objectives:** The objective of this paper is to report the case of an intracranial migration of a ventriculoperitoneal shunt.

**Background:** The intracranial migration of a ventriculoperitoneal shunt (VPS) has been previously described, mechanisms of this migration have not been elucidated, to our best knowledge this is the twelfth case reported in literature.

**Methods:** Newborn female delivered at 38 weeks of gestation by cesarian section, suffering from congenital hydrocephalus diagnosed four weeks before birth that required the placement of a ventriculoperitoneal (VP) shunt. At 1- and 2-months follow-up, the x-rays and simple head CT showed that the VP shunt cranially migrated and was not appropriately working. (Figures 2 and 3). A second VP shunt was placed in the left Kocher point, which unfortunately failed to work correctly (Figure 4).

As of November 2021, with the help of physical therapy and rehabilitation, the patient is three years old, attends a local school, and the system is still functional with no signs of neurological deficit (Figure 6).

**Results:** A rare complication of ventriculoperitoneal shunt surgery is the total cranial migration of the system. Only few cases have been previously described, and different possible mechanisms have been proposed, such as negative intraventricular pressure, positive intra-abdominal pressure, excessive movements of the neck and head, the use of catheters without valves, the lack of use of a reservoir, excessive burr hole size and dural incision, as well as occipital ventricular access, thin cortical mantle, incorrect distal and proximal fixation, supine position, short distance between the peritoneum and ventricles (compared to an adult), and a possible inflammatory reaction to the catheter's material (silicone) [1-10]. A combination of these different mechanisms contributes to proximal shunt migration.

**Conclusions:** Although the placement of a ventriculoperitoneal shunt is a procedure well taught since the first years of neurosurgical residency, it is not exempt from complications.

## Oncology

ePoster presentation

Intracranial metastasis of gastrointestinal stromal tumours: a dead end? Systematic review of published case reports and case presentation

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**Objectives:** This is a systemic review of published case report and case presentation of intracranial metastasis of gastrointestinal stromal tumours (GISTs).

**Background:** Intracranial metastasis of GISTs is uncommon and the optimal management for these patients remain undefined. The introduction of TKI has drastically improved survival in patients. However, its efficacy in intracranial metastasis is uncertain due to poor penetration of the blood brain barrier. The role of surgery and radiotherapy in these patients has also not been well established. No large-scale studies exist and the literature is limited to case reports. We report a case treated at our institution, conducted a systematic review of existing case reports, and discuss the optimal management of patients with intracranial metastasis of GISTs.

**Methods:** The systematic review was conducted according to PRISMA guidelines. All studies with intracranial metastasis of GISTs were included, with data extracted and analyzed in totality.

**Results:** 26 cases were included in the review. The median time to diagnosis of intracranial metastasis in patients with previously known GIST tumours was 66 months. Solitary metastasis was seen in 16 cases (59.3%). 18 patients (69.72%) underwent surgical resection; 14 had adjuvant therapy with 9 receiving TKI. Clinical response was seen in 3 patients in the non-surgical group, all three were treated with TKI alone.

**Conclusions:** The effectiveness of TKI in intracranial GISTs metastasis is seen both as first-line therapy for asymptomatic lesions and as an adjuvant treatment post-surgery. Surgery retains a key role in establishing histological and molecular diagnosis and for symptomatic relief of mass effect.

## Functional

Oral presentation

### The death of ablative surgery

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**Objectives:** To review the evidence surrounding the acceptance of the superiority of deep brain stimulation (DBS) over radiofrequency lesioning.

**Background:** Radiofrequency lesioning has gradually been phased out of functional neurosurgery. The reasons for this may reflect progress or it could reflect a cautionary tale in medicine that we are seeing in other sub-specialities as well.

**Methods:** A thorough literature review was undertaken looking at how radiofrequency lesioning was phased out in favour of deep brain stimulation for movement and psychiatric disorders to the point now where it is rarely performed and almost all neurosurgery trainees have no exposure to it.

**Results:** There was limited evidence of any superiority of DBS in movement disorders or psychiatric disorders despite the marketing of reversibility and adjustability.

Radiofrequency is much cheaper, has very little followup commitment and has the capacity to treat the world population rather than the 20% of the population who can afford DBS, focussed ultrasound or gamma knife treatment. There is some evidence of its superiority in some conditions over DBS.

There are no hardware complications with lesioning, no acute battery failures, complications with diathermy or followup commitments. Poor followup of DBS patients is an ongoing ethical concern.

Issues continue with MRI and DBS with 80 % of patients needing an MRI in their lifetime. DBS is life maintenance for patients in people who are increasingly seeking minimally invasive options.

**Conclusions:** Patients are best served when they can make informed decisions on all therapy. Cost is an issue even in developed countries and radiofrequency lesioning still almost certainly still has a place in both developed but particularly developing countries.

Marketing influencing science is an ongoing concern in medicine.

## Neurovascular Surgery

ePoster presentation

Surgical strategies using skull base techniques in paraclinoid aneurysms, technical details and functional results

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**Objectives:** Describe the surgical strategies used and demonstrate their validity for the benefit of neurological functional status.

**Background:** The treatment of paraclinoid aneurysms remains a great challenge due to the anatomical characteristics. To expose it, we require different surgical strategies that allow us to expand the work area and preserve the adjacent anatomical structures. Skull base techniques such as anterior extradural clinoidectomy have improved surgical results. Surgery shows greater exclusion of the aneurysm, especially in large and giant ones.

**Methods:** Patients operated between 2018-2022. Observational study (series of cases), descriptive and retrospective. We included people over 18 years of age diagnosed and subjected to clipping. We use variables from the database in Excel and processed in SPSS Statistics version 28.0.1.1

**Results:** 27 were operated. 18 broken and 9 not broken. 10 ophthalmic, 16 pituitary and 1 transitional. Complete occlusion 26 (96.30%) and 1 (3.70%) partial. Total visual recovery in 8 and 2 permanent visual loss. One deceased due to vasospasm and cerebral infarcts. 85.19% (n=23) women; 14.81% (n=4) men. Mean age 57 ± 7.70 years. 51.85% (n=14) Lima; 48.15% (n=13) from provinces. Median disease time 1.5 days (1-28). 74.07% (n=20) HTA. 48.15% (n=13) minipterionales; 48.15% (n=13) pterionales; 3.70% (n=1) decompressive. 100% anterior extradural clinoidectomy and cervical control. 81.48% (n=22) mini-peeling. 25.93% (n=8) retrograde suction-decompression. 29.63% (n=8) of ATS-MCA bypass. Functionality improvement of 84.6% at 6 months. SRm <2.

Characteristics No. (%)	N (%)
<b>Sociodemographic</b>	
Age (years)*	57 ± 7.70 (39-80)**
<b>Gender</b>	
Female	23 (85.19)
Male	4 (14.81)
<b>Comorbidities</b>	
HTA	20 (74.1)
Type 2 diabetes	2 (7.4)
Obesity	8 (29.6)
Tuberculosis	1 (3.7)
<b>Clinic at discharge</b>	
Fisher	4 (3 – 4)†
Hunt-Hess	2 (2 – 3)†
WFNS	2 (2 – 3)†
Glasgow escale	12 (10 – 13)†
<b>Aneurysm diagnosis</b>	
pituitary	16 (59.3)
Right	13 (81.3)
Left	3 (18.8)
Ophthalmic	10 (37.0)
Right	6 (60.0)
Left	4 (40.0)
Transicional	1(3.7)
Right	
Left	1(100)
<b>complications</b>	
Vasospasm	10 (37.0)
Surgical site infection	3 (11.1)
Intracranial hypertension	10 (37.0)
Cerebral infarction	5 (18.5)
Urinary tract infection	2 (7.4)
CSF fistula	4 (14.8)
<b>Clinic at discharge and follow-up</b>	
Glasgow scale at discharge	14 (14 – 15)†
Rankin scale modified at discharge	1 (1 – 3)†
Rankin scale modified per month	1 (1 – 2)†
Rankin scale modified at 3 months	1 (1 – 3)†

Table 2. Baseline characteristics of the included patients.

**Conclusions:** These unified surgical strategies allow greater clipping safety and less morbidity. The skull base technique creates a large, safe surgical space that reduces the risk of neurovascular injury.

## Spine

Oral presentation

Emergency referrals for suspected cauda equina syndrome in the North East of England and the impact of the coronavirus pandemic

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**Objectives:** To audit the speed from neurological examination, to emergency referral, imaging and ultimately surgery for suspected cauda equina syndrome in the North East of England.

**Background:** Cauda equina syndrome (CES) is an emergency and without rapid examination, imaging, and surgery, can lead to irreversible sensory and motor disability.

In April 2019, the Refer-a-Patient referral system was introduced at James Cook University Hospital, a tertiary hospital in England. This has provided opportunity to collect data on the timeliness of emergency referrals for cases of suspected CES.

Despite standards of care being set by both SBNS and BASS, along with literature stressing the urgency of timely referral, MRI and subsequent decompression of CES, no specific numerical standard or compliance rates are available in the literature.

**Methods:** Cases referred to the on-call registrar for suspected CES from across the region were retrospectively reviewed for timings from:

- Neurological examination to referral (within 4h)
- Referral to MRI (within 6h)
- MRI to surgical decompression (within 6h)

All standards set at 100% compliance

**Results:** In 2019, of all cases of suspected CES referred to the on-call spinal registrar (n=86), 94.7% were referred following examination within 4 hours. In 2021 (n=121), 93.1% of cases met this standard.

Regarding time from referral to urgent MRI, 71.2% of cases in 2019 achieved this within 6 hours. In 2021, 60.4% of cases met this.

Finally, MRI to decompression was achieved within 6 hours in 41.7% of cases in 2019, with only 13.3% meeting this standard in 2021.

**Conclusions:** Regionally, referral timings set against locally devised standards, influenced by guidelines set out by BASS and SBNS, were below par. The coronavirus pandemic in 2021 delayed the referral process further, resulting in major implications for patient care regarding suspected CES. Further analysis is needed to investigate these delays and their ultimate impact on disability secondary to CES.

## Skull Base

ePoster presentation

### State of survival outcomes following surgical resection of clival chordoma: systematic review and meta-analysis of progression free and overall survival

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**Objectives:** We perform a systematic review and meta-analysis in order to profile surgical and survival outcomes for clival chordoma.

**Background:** Despite their precarious behavioral classification (histopathologically benign (low-grade), behaviorally malignant), great strides have been taken to improve prognostication and treatment paradigms for patients with skull base chordoma. However, due to the rarity of this tumor, prior investigations remain limited to small retrospective series.

**Methods:** Fixed and random-effect meta-analyses were performed for categorical variables including number of males, GTR, STR, 5-year OS, 10-year OS, 5-year PFS, and 10-year PFS.

**Results:** Following the systematic search and screen, 47 studies published between 1993-2020 reporting data for 2204 patients remained eligible for analysis. Sex distribution was comparable between males and females, with a slight predominance of male-identifying patients (0.5625 [0.5418;0.3909]). Average age at diagnosis was 42.4 ± 12.5 years, while average age of treatment initiation was 43.0 ± 10.6 years. Overall, there was a substantial degree of heterogeneity across the 47 studies ( $I^2=56.3\%$  [44.0%; 65.9%]). With respect to operative margins, the rate of GTR was 0.3323 [0.2824; 0.3909],  $I^2 = 91.9\%$  [90.2%; 93.4%], while the rate of STR was significantly higher at 0.5167 [0.4596; 0.5808],  $I^2 = 93.1\%$  [91.6%; 94.4%]. Interestingly, 5-year OS rate was 0.7113 [0.6685; 0.7568],  $I^2 = 91.9\%$  [90.0%; 93.5%]. Furthermore, 10-year OS rate was 0.4957 [0.4230; 0.5809],  $I^2 = 92.3\%$  [89.2%; 94.4%], which was comparable to both 5-year PFS rate of 0.5054 [0.4394; 0.5813],  $I^2 = 84.2\%$  [77.6%; 88.8%] and 10-yr PFS rate of 0.4949 [0.4075; 0.6010],  $I^2 = 14.9\%$  [0.0%; 87.0%]. There were 55 reported deaths for a perioperative mortality rate of 2.5%. The most common complication was CSF leak (5.4%).

**Conclusions:** Overall, these results indicate good 5-year outcomes; however, 10-year prognosis for clival chordoma remains poor due to its radiotherapeutic resistance and high recurrence rate.



## Education, Ethics, Socioeconomic

Oral presentation

An international comparison of out-of-pocket expenditures for emergency neurosurgical care

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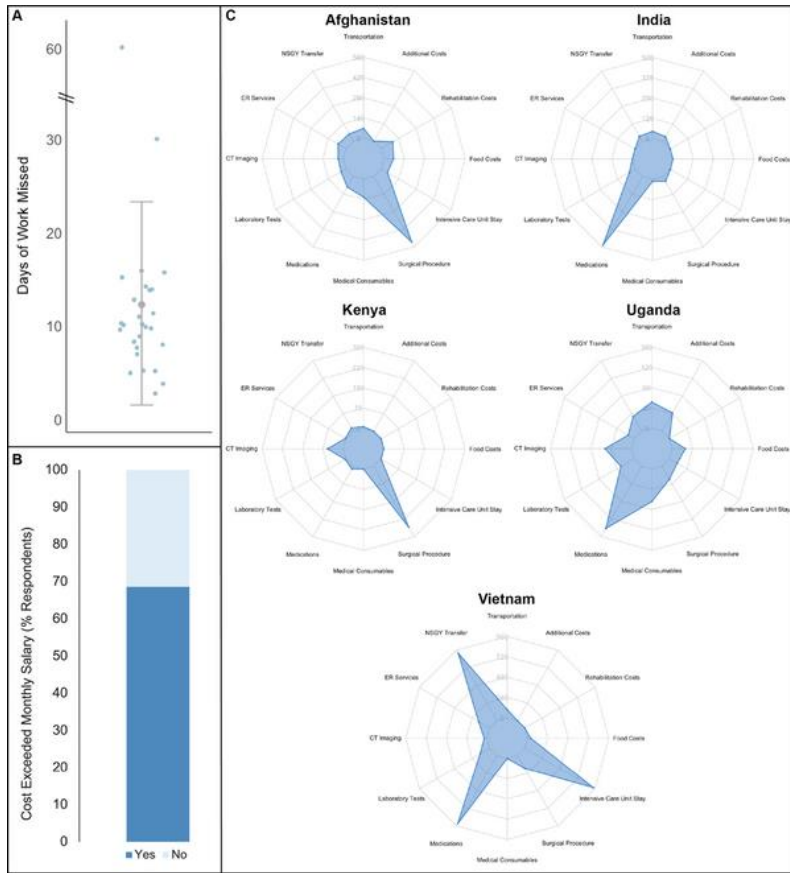
**Objectives:** The main objectives are:

- (1) to capture sources of financial hardship occurring in the context of acute neurosurgical emergencies across countries and different healthcare contexts and
- (2) to describe regional and continental differences in direct and indirect costs of seeking emergency neurosurgical care.

**Background:** Creating equity in global neurosurgery requires patients to have access to timely, safe and affordable neurosurgical care. Improvements have been made in expanding the neurosurgical workforce, but little data regarding costs of operations has been reported. This study presents cost data gathered from patients at the time of hospitalization for two common neurosurgical procedures.

**Methods:** A survey regarding direct and indirect costs of seeking neurosurgical care was distributed to international collaborators in countries representing varied geographical regions and income classifications. Adult patients undergoing craniotomy for trauma or shunt placement for hydrocephalus were included. Patients or their companions answered questions regarding out-of-pocket costs in their currency of choice, and all costs were later standardized for comparison.

**Results:** A total of 35 survey responses were included from Afghanistan, India, Kenya, Uganda, and Vietnam. Surgical procedure and post-operative medications accounted for the highest out-of-pocket expenses in all countries. Measures of financial toxicity associated with undergoing surgery included missed workdays, loss of employment and costs of care exceeding a typical one-month salary.



A. Days of work missed during hospitalization B. Patients incurring costs exceeding monthly salary. C. Distribution of costs

**Conclusions:** Cranial trauma surgery and hydrocephalus treatment together account for a significant proportion of emergency neurosurgical cases worldwide. The cost that a patient and family must non-electively pay both directly and indirectly to access this care varies widely. As access to neurosurgery expands, we must further delineate catastrophic expenditures incurred by patients to ensure equality of access to safe, timely, and affordable neurosurgical care.

## Trauma

Oral presentation

Posterior C1-2 pedicle screws fixation for the treatment of unstable complex C2 fractures: our experience

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**Objectives:** To assess the effectivity of posterior fixation for complex C2 fracture with instability. The effectiveness was measured in improvement in neck disability index (NDI) and range of movement of the neck and functionality of the patient

**Background:** Usually anterior lag screw is the treatment of stable C-2 fracture. But when there is associated ligamentous injury and instability, posterior fixation is a very good method.

**Methods:** A total of 9 patients were included in the study (8 males and 1 female). Their age ranged from 43 to 76 years. The patients were diagnosed with complex fractures of the axis of the upper cervical spine and underwent posterior C1-2 pedicle screws fixation. The patients underwent a serial postoperative clinical examination at approximately 3, 6, 9 months, and annually thereafter. The neck disability index (NDI) and the range of neck rotary motion were used to evaluate the postoperative clinical efficacy of the patients.

**Results:** The mean follow-up was 1-3 years. The average operation time and blood loss were 105-150 min and 50-75 ml, respectively. The neck disability index was improving after surgery to a great extent. The patients with myelopathy (specifically in old C2 fracture with cord compression) also showed significant improvement as assessed by Nurick grading

**Conclusions:** Posterior screw fixation is a good surgical treatment option for unstable complex C2 fractures.

## Education, Ethics, Socioeconomic

Oral presentation

Post Covid-19 evolution of our neurosurgical and nursing practice and activities

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**Objectives:** The aim is to measure Neurosurgical practice evolution since Covid-19 and to understand causal factors.

**Background:** Covid 19 period lack of resources for classical care, followed by OR nurses and resources shortages have modified our practice.

A period of prioritization related to lack of neurosurgical dedicated resources during covid 19 pics was followed by another type of case prioritization probably in relation to nurse shortage.

**Methods:** Before Covid WHO Health Systems and Policy Monitor (HSPM) data and Belgian Public Health care data and coding statistics before, during and after Covid-19 were analyzed.

Data were also collected in the 2022 "This Is The State of Nursing" report by [Nurse.org](https://www.nurse.org).

**Results:** Before covid, there was a decline in number of beds but total number of active nurses increased (except in UK or during 2020, in Belgium when their cursus change from three years to four).

Type of pathology treated were significantly modified during and after covid19.

In brain, radiosurgery increased regularly. Stereotactic biopsies that were declining before Covid-19, reincreased in 2020 and 2021. Other brain pathologies were nearly stable in proportion and absolute numbers.

In spine, in percentage, numbers of arthrodesis declined and simple procedures as lumbar discus hernia raised in significant proportion, or spinal stenosis in a lesser proportion. Cervical arthrodesis or arthroplasty declined but came back to previous proportions in 2021. Absolute numbers in spine were 15 % less in 2020 but still are 7 % less in 2021 compared to 2019.

Really active nurses available number is now different. Burn out and carrier reorientation lowers the number of nurses present in the hospital wards and operating rooms.

**Conclusions:** Nurse students, teachers and professionals must be better supported logistically and financially to take care for sectors as OR, neurosurgical wards or ICU.

To support them is mandatory to maintain high quality and available neurosurgical care.

## Spine

ePoster presentation

### Surgical tactics for the ossified posterior longitudinal ligament of the cervical spine

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**Objectives:** This paper aims to present (1) current indications of anterior or posterior approaches for surgical treatment of ossified posterior longitudinal ligament (OPLL) of the cervical spine, and (2) recent evolutions of the newly developed titanium implant for cervical laminoplasty.

**Background:** OPLL of the cervical spine is one of the major causes of significant myelopathy, and various surgical treatments through either anterior or posterior approach have been reported with generally satisfactory results. The author always considers anterior approach first for the treatment of degenerative cervical spine disease including OPLL, because anterior decompression has the advantage of direct removal of the pathology causing the compression of the spinal cord. The posterior approach is therefore preferred if the anterior approach does not have clear advantages.

**Methods:** From January 2008 to December 2022, 1716 spine operations were conducted by the author. Of which 515 patients (30.0%) were degenerative cervical spine disease including OPLL, and 388 patients (75.3%) were treated via anterior approach, while the other 127 patients (24.7%) were treated posteriorly. OPLL as the primary cause of myelopathy was relatively rare (71 patients, 13.8%), and both anterior and posterior approaches were indicated equally (36:35). Threaded cylindrical titanium cages (m-cage series, Ammtec, Tokyo) were mainly used in the anterior approach, and titanium plates with basket component (Laminoplasty Basket, Ammtec) were applied to the posterior approach.

**Results:** There were 2 cases of CSF leakage with anterior approach. Transient C5 nerve root palsy was noted in each 1 patient of both anterior and posterior approaches. No patient developed postoperative hematoma, surgical site infection and other major complications.

**Conclusions:** Uniform application of certain surgical technique to this clinical entity is not appropriate, and surgical strategies should be independently selected to each patient, according to the patients' symptoms and radiological features of the OPLL to obtain satisfactory outcome.

## Spine

ePoster presentation

### An integrative approach for complication avoidance in spine care

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**Objectives:** This paper aims (1) to present the author's recent attempt with an integrative approach in perioperative treatment in spine care, and (2) to provide safer pain management to the patients with spinal disorders.

**Background:** Kampo medicine, or traditional Chinese medicine, is widely accepted as the freeze-dried extract granules or tablets in the daily practices of Japanese physicians and surgeons. Each medicine includes thousands of compounds, and this "super multi-component medicine" is considered to stabilize homeostasis by maintaining body moisture level, microvascular circulation, immune and anti-inflammatory systems, and body thermogenesis. Non-steroidal anti-inflammatory drugs (NSAIDs) are frequently prescribed for the postoperative pain management, but repetitive use of NSAIDs may develop gastrointestinal and cardio- or cerebrovascular complications. Kampo medicine has been known to provide solutions to reduce NSAIDs-associated risks.

**Methods:** From January 2019 to December 2022, a total of 284 spine operations were conducted by the author, of which 59 patients with Balloon Kyphoplasty for acute osteoporotic vertebral compression fracture and multiple myeloma were excluded. For the other 225 patients, keishibukuryogan (TJ-25, Tsumura, Tokyo) and saireito (TJ-114) were prescribed in order to promote early postoperative wound healing and to enhance pain relief. In one patient with paralytic small intestine following acute cervical cord injury, bukuryoin (TJ-69) and hangekobokuto (TJ-16) were additionally prescribed.

**Results:** No patient developed surgical site infection, and early healing of the operative wound with less edematous appearance was noted. There was a tendency of reduced use of NSAIDs, compared to the previous cases. In the patient with acute cervical cord injury, paralytic small intestine was effectively treated only by kampo medicine. There was no complication associated with administration of kampo medicine in the present series.

**Conclusions:** Integrative treatment with kampo medicine is considered to be beneficial in spine care by reducing perioperative complications and improving patients' safety.

## Paediatric

ePoster presentation

### Choroid plexus tumor: an institutional experience

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**Objectives:** Review of the cases of choroid plexus neoplasm in a tertiary center of Armed Forces and correlate the outcome at 5 years

**Background:** Choroid plexus tumors (CPT) are rare and complex neoplasms that pose a significant challenge in the neurosurgical parlance. Due to its rarity, this may also contribute in analysing in future studies.

**Methods:** This is a retrospective study of 8 patients operated on for CPT. These patients were regularly followed up at 6months, and 1,2,3,5 years either telephonically or in the outpatient department. Glasgow outcome score (GOS) was used to analyze the outcome at regular follow-ups.

**Results:** The study group consist of eight patients of CPT which, included 05 (62.5%) cases of choroid plexus papilloma (CPP), 03 (37.5%) cases of choroid plexus carcinoma (CPC). The mean age at presentation was 4 years and a male preponderance was noted (5:3). The tumors were located mainly in lateral ventricle (6;75%) and 2 at III Ventricle (2;25%). Histopathological examination revealed five CPP and three CPC. Operative complications include pneumocephalus (50%), focal deficits (28.5%), and one (12.5%) patient who died due to infection. Four patients had favorable outcomes on discharge, two had moderate disabilities, and one had severe disabilities. On follow-up at three years, two patients with moderate disability improved to GOS 5. One of the patients with a severe disability died due to aspiration after two years. At five years of follow-up, all five were Glasgow Outcome Score of 5.

**Conclusions:** Gross Total resection (GTR) presents unique challenges due to limited blood total blood volume, anesthetic consideration, availability of pediatric neurosurgical ICU, and trained healthcare workers in managing these patients. There are various methods to decrease vascularity pre-operatively like embolization. However, in our study only one case could be embolised preoperatively. The three-year follow-up for complete resection of CPP has shown a good favorable outcome.

## Trauma

ePoster presentation

Surviving headshot: outcomes of survivors of combat related penetrating brain injury in a tertiary medical institution from 2017 – 2022

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**Objectives:** The aim of the study is to create a registry of all surviving patients who had combat related penetrating head injuries and to identify the current status and specific problems of the said population and to identify factors present among those who survived penetrating head injuries that may be contributory to better Glasgow Outcome Scores that may augment decision making and policy creation.

**Background:** Penetrating brain injury (PBI) is a traumatic brain injury that is a noteworthy cause of mortality. In the Philippine setting, there is no current published data to properly assess the incidence of penetrating head injuries. In the Marawi siege last June 2017, it was reported by the deployed Medical Personnel that penetrating brain injuries had 92% lethality with only 4 survivors. Thus, data for these patients is lacking in the current paradigm and research environment.

**Methods:** This study employed a retrospective case series design to estimate the incidence rate and identify factors associated with Survivors of Penetrating brain Injuries. The differences between patients with Glasgow Outcome Scores of 2-3 and 4-5 were identified to see which factors differed between the two groups is significant in improving the outcomes among survivors. In addition, associated factors to survival after penetrating head injury will be determined.

**Results:** In total, 31 survivors of penetrating brain injuries were identified and have consulted with the study setting. The characteristics of the said survivors have been properly identified and analyzed. Comparisons between the survivors with Glasgow Outcome scores of 2-3 versus 4-5 were done.

**Conclusions:** The study was able to show that the location of hemorrhage is the most significant prognosticating factor followed by an expedited time of evacuation from the Nearest Facility to a Neurosurgical Capable Center. This data can be useful in determining prognosis and setting expectations during neuro-rehabilitation for these patients.



## Neurovascular Surgery

ePoster presentation

Is water tight dural closure necessary? A meta-analysis comparing the safety of the type of dural closure in Decompressive Hemicraniectomies

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**Objectives:** The study aims to determine the if there is a significant difference between watertight dural closure and non-watertight dural closure in Decompressive Hemicraniectomy secondary to Traumatic Brain Injury or Malignant Cerebral Infarction in terms of complication rate and OR procedural time.

**Background:** Watertight dural closure has been thought by countless of senior neurosurgeons as a prerogative in every intracranial operative procedure. Primary watertight dural closure has always been difficult in the setting of Decompressive Hemicraniectomy where in the goal is to increase the size of the cranial vault to allow space for expansion of the edematous brain. Thus, the question remains. Is water tight dural closure really necessary? Is there a difference between performing the said procedure in terms of adverse outcome?

**Methods:** Electronic Databases and relevant websites were searched and the researchers were able to gather 4 studies that were qualified to be included in the study. Reviewers were able to assess the study designs and characteristics

**Results:** The study is able to incorporate a total of 387 patients who underwent decompressive hemicraniectomy. In terms of the outcomes, there were a total of 92 or 24% patients who developed complications among the study population. The water tight dural closure group had 45 patients with complications or 20%. The non-water tight dural closure group had 47 patients who developed complications or 28%. The water tight dural closure group had the mean OR time of 135 minutes. The non-water tight dural closure group mean OR time was 87 min. There is a noted 46 minutes difference between the two groups.

**Conclusions:** The study shows that the use water tight dural closure is used in decompressive hemicraniectomy is not protective or preventive in reducing complication rates. Furthermore, the use of water tight dural closure increases OR procedural time which may be detrimental to the unstable patient.

## Epilepsy

ePoster presentation

Epilepsy surgery in developing countries: how to initiate a multidisciplinary team with low resource setting

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**Objectives:** We review our experience in initiating multidisciplinary team with low resource setting in a developing country and outcomes of resective epilepsy surgery using recent pre and intraoperative brain mapping and electrocorticography (ECoG) techniques for ensuring satisfactory resection of such cases.

**Background:** Neurosurgery is an underutilized treatment that can potentially cure drug-refractory epilepsy. Careful, multidisciplinary presurgical evaluation is vital for selecting patients and to ensure optimal outcomes. Resective epilepsy surgery is currently a standard treatment for intractable focal epilepsy.

**Methods:** We performed a 2-years review of patients (n=50) with a diagnosis of intractable focal epilepsy, who underwent epilepsy surgery and were followed up for at least 12 months, and were evaluated for postoperative outcome. Pre-operative comprehensive evaluation was performed by multidisciplinary epilepsy team. Intraoperative brain mapping techniques including neurophysiological monitoring and electrocorticography were carried out during surgical resection. Operative complications, neurological deficits, and extent of resection were evaluated. Engel class I–IV classification was the primary outcome measure of epilepsy surgery.

**Results:** There were 27 male and 23 female patients with a mean age of 16.3 years. 22 patients were temporal while 28 were extra-temporal. There were no major anesthetic complications. Postoperative immediate neurological deficit was seen in 4 patients 8% and this was permanent in only one patient (2%). The success rate as Engel class I was 76%. 12% and 8% of patients showed Engel class II and III respectively, while 2 patients (4%) showed no worthwhile improvement as Engel class VI.

**Conclusions:** We found favorable outcomes after surgery in focal epilepsy patients after careful presurgical multidisciplinary selection, especially with using intraoperative mapping and electrocorticography techniques; so we believe that it is a major treatment option, even in less resource settings, and should be encouraged. Dissemination of such knowledge and improving infrastructure may be considered an urgent clinical need especially in developing countries.

## Oncology

Oral presentation

### Intraoperative video-photodiagnosis during resection of pituitary adenomas with Chlorin e6 photosensitizer

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**Objectives:** Evaluate the use of Chlorin-type photosensitizer (Ce6) and two-channel video-fluorescence system for fluorescence-guided transnasal resection of pituitary adenoma (PA).

**Background:** Photodiagnosis is one of the promising methods for intraoperative detection of brain tumor boundaries and zones of its infiltration, and can significantly increase the degree of tumor resection. This pilot study presents the results of the clinical use of Ce6 and a two-channel video-fluorescent system for resection of PAs under fluorescent monitoring.

**Methods:** The study involved 6 patients with hormonally inactive PA and 4 with hormonally one. Ce6 PS was used for video-photodiagnosis (VPD) and was intravenously injected to the patients 3-3.5 h before diagnostic at a 1 mg/kg concentration. VPD was carried out using two-channel video-fluorescent system consisting of white light and laser (635 nm) sources, a system of optical filters, and a rigid endoscope. After endoscopic transnasal transsphenoidal access to the PA, the localization, the size of the tumor, and zones of infiltration with increased fluorescent signal of Ce6 were determined. The resection of the tumor was stopped when the residual part of the tumor and its capsule infiltrated by the tumor tissue were intimately fused with vital structures, such as the internal carotid artery and oculomotor nerves, or tumor was totally removed.

**Results:** After the data processing, the accumulation of Ce6 in pathological tissues was determined in 9 patients (90%). In 2-residual part of the tumor was not resected since it was intimately attached to the anterior genu of the internal carotid artery. In 7-no regions with increased Ce6 accumulation were not detected in the tumor foci after resection.

**Conclusions:** Ce6 PS had a high accumulation in hormonally inactive PA, as well as in hormonally active. The use of VPD during PAs resection helped to achieve a higher degree of tumor resection in comparison with resection under the white light control.

## Trauma

Oral presentation

Allogenic human Wharton's jelly derived mesenchymal stem cells transplant for functional recovery in patients with traumatic brain injury

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**Objectives:** To investigate the recovery/non-recovery of neurological clinical parameters post-transplantation of allogenic Wharton's jelly-derived mesenchymal stem cells in patients with Traumatic Brain Injury.

**Background:** Evolving knowledge of cell therapy, and its mechanistic potential advantage brings us to a cross-road of applications, especially in disease conditions where not only other treatment modalities have failed. One such condition is the TBI with Glasgow Coma Scale (GCS)  $\geq 3$ . Animal model studies conclude that MSCs might be beneficial in treating TBI and thus indicated that MSCs could be a potentially new therapeutic candidate for TBI.

**Methods: Group I (Experimental)** = TBI patients\* (Glasgow Coma Scale - 3 to 8) receiving Standard of care + WJMSC treatment

**Group II (Control)** = TBI patients\* receiving Standard of care only.

**Study duration:** 2 Years

**Assessment:** Days 30, 90, and 180 days of the last dose of cell therapy.

**Stemcell therapy**

Allogenic UC-MSCs cell suspension (total dose of  $50 \times 10^6$  cells) in normal saline injected, divided into 5 doses, over 0-7 days, the first transplantation to begin within 24 hours.

**Results:** Our data revealed that MSCs delivery within 24 hours after severe TBI resulted in substantial improvement in functional recovery. We transplanted 4 patients and specifically evaluated the efficacy on the basis of neurological parameters like FIM and DRS. Based on FIM score evaluation at 180 days, the self-care sub-scores ( $P < 0.01$ ) transfers sub-score ( $P < 0.02$ ), locomotion sub-score ( $P < 0.01$ ), and communication sub-score ( $P < 0.01$ ) were significantly improved post-treatment.

Based on the DRS score evaluation, the Consciousness sub-score ( $P < 0.01$ ), Cognitive sub-score ( $P < 0.01$ ), and Dependence on others ( $P < 0.02$ ) were significantly improved post-treatment.

**Conclusions:** WJMSC therapy provides better clinical outcomes with reference to neurological function, arising due to injury, enhancing endogenous neurogenesis, and overall better quality of life. As TBI patients require early treatment options so an allogenic WJMSC source is a safe cell-based therapeutic option.

## Skull Base

ePoster presentation

### The "Smile Technique" for endoscopic pituitary adenoma surgery

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**Objectives:** To assess the extent of tumor removal and the rate of CSF leak in endoscopic trans-nasal trans-sphenoidal pituitary adenoma surgery using the "Smile Technique".

**Background:** Among the potential approaches to access the sellar suprasellar region, the endoscopic trans-nasal trans-sphenoidal approach appears to be the most direct and conservative route. In the steps of endoscopic surgery, the most critical and important step is the dural opening followed by the dural repair at the end of surgery to prevent the dreaded complication of CSF leak. The dura may be opened in many ways; however, in this article, we aim to detail the "Smile Technique" of dural opening and the relevant surgical steps necessary to perform a robust dural reconstruction to avoid CSF Leaks in a reproducible and safe manner.

**Methods:** Standard steps of tran-nasal trans-sphenoidal pituitary surgery are carried out up to the sellar stage. The sella is opened and the dura is exposed. The dura is opened in a curvilinear fashion and the tumor capsule is dissected off the dura. The tumor excision is done using standard endoscopic techniques. At the end of the tumor excision, the arachnoid is inspected and robust multilayer dural reconstruction is done using fat graft, surgical fibrillar, duragen patch, and glue.

**Results:** We tried this technique in 25 patients in the past two years and have noticed complete tumor excision in all the cases and zero cases of CSF leak.

**Conclusions:** "Smile Technique" is a safe and reproducible method of dural opening that has significantly minimized the chances of CSF leak post-operatively in endoscopic tran-nasal trans-sphenoidal pituitary surgery.

## Trauma

ePoster presentation

Extraction of a metal arrow entering the skull base using a three-surgeon combined microscopic and endoscopic approach

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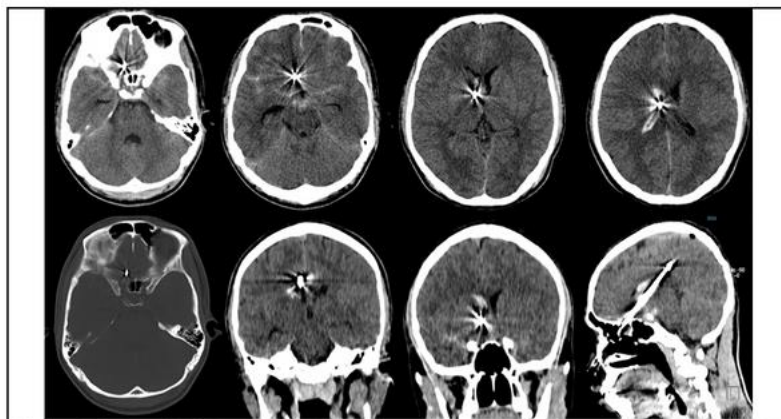
**Objectives:** This is a case of an 18-year-old male with a penetrating brain injury caused by a metal fishing spear entering his right nostril without a point of exit coming in 10 hours post-injury with a Glasgow Coma Score of 13. Cranial imaging showed the arrow traversing the posterior ethmoids, entering the frontal skull base, grazing through the right lateral paraventricular area, and lodging in the parietal cortex.



**Figure 1.** Pre-operative photograph of the patient showing the entry point of the improvised fishing spear made of steel rod with the arrow's nock enveloped by a plastic encasement which is protruding from its entry point on the right nostril. It also has a string which partially cut thru the nostril.



**Figure 2.** Skull radiographs on lateral (left) and anteroposterior (right) views. These show the trajectory of the arrow traversing through the posterior ethmoids entering the skull base projected slightly towards the right approximately 2 cm off midline, estimated at 20 cm in length.



**Figure 3.** Plain cranial CT scan done 10 hours post-injury showing perimesencephalic subarachnoid hemorrhage.

**Background:**

**Methods:** A 3-surgeon combined microscopic-endoscopic approach with the use of intraoperative ultrasound, angiogram, and C-arm localization was done. This involved a 5-part procedure: internal carotid angiography; parieto-occipital vertex craniotomy with ultrasound guided localization; right transclivary cranio-orbito-zygomatic osteotomy transclivary approach; endoscopic guided advancement and extraction of foreign body and endoscopic endonasal transsphenoidal repair of skull base defect. The rationale for the procedures borders on obtaining information on the relationship of the arrow to the major vessels at the base of the brain, visualization of the arrow's entry into the skull, guidance on the point of exit as the arrow was pushed upwards towards cortex and extracted it from the surface, and the integrated use of a basal approach for actual visualization of the shaft of the arrow.

**Results:** The patient remained clinically and neurologically stable post-operatively and was discharged after 10 days. He was back to pre-morbid functional status during follow-up at the outpatient two weeks after surgery

**Conclusions:** Presented is a successfully managed case of low velocity PBI. The knowledge of surgical anatomy combined with the different concepts and principles of neurosurgery led to the development of combined techniques that can be used and may further improved in the management of these injuries.

## Oncology

ePoster presentation

### Combined use of 5-ALA and Chlorin e6 for fluorescence-guided resection and photodynamic therapy of glioblastoma

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**Objectives:** Assess clinical outcomes of the patient with glioblastoma after intraoperative controlled PDT with two PSs.

**Background:** The search of new treatment approaches of the most aggressive brain tumor, such as glioblastoma, is a big priority in neurooncology. Currently, intraoperative PDT of glial brain tumors was performed only with one PS: 5-ALA-induced PpIX or talaporfin sodium. However, this strategy is effective not in all cases. In this study we demonstrate a new approach for PDT of glial brain tumors and clinical outcomes of the patient with a glioblastoma.

**Methods:** Resection of the tumor was accompanied by intraoperative neurophysiological monitoring. After the resection of the main tumor part, PD of residual regions was performed using a fiber-optic spectrometer, He-Ne laser source, and diagnostic optical fiber illumination. Additional resection of detected residual parts was performed. PDT of residual parts that are impossible to resect was performed using two laser sources with a wavelengths 635 nm and 660 nm and optical fiber. Total energy dose was 60 J/cm<sup>2</sup>. The irradiation time was 14 min.

**Results:** High level of PSs accumulation in tumor tissues allowed us to perform total resection of tumor tissue according to MRI and CT images and remove additional tissue with increased fluorescence intensity without irreversible neurological deficit for the patient, and perform additional therapy. On 24<sup>th</sup> month after diagnosis of glioblastoma no recurrent tumor in the tumor bed were detected. At the moment the patient is active, and his Karnofsky performance status scale score is 70.

**Conclusions:** To improve the clinical outcome of PD and PDT, the combination of two PSs can be used for intraoperative navigation, photodamage of the vascular system, promoting necrosis, and/or apoptosis of tumor cells.



## Epilepsy

ePoster presentation

### Tuberous sclerosis epilepsy: surgery and gene therapy

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**Objectives:** Tuberous sclerosis (TS) is rare genetic disease in which benign tumors form in many organs and tissues. The polysystemic nature of disorders gives rise to a wide range of symptoms, brain damage can cause epilepsy, decreased intelligence; internal organs are affected: kidneys, heart, lungs; characteristic neoplasms of the skin of the face and the fundus of the eye can be used in initial diagnosis.

**Background:** Theoretical and experimental rationale for use of mTOR inhibitors in TS. Kinase is a key link responsible for cell proliferation, regulation of the cell cycle and cell metabolism. As a result of mTOR activation, cell growth and proliferation is enhanced, as well as angiogenesis activation, which causes the development of tumors (hamartomas).

**Methods:** Under our observation were 56 tuberous sclerosis (TS) patients men and women, from 18 to 62 year old. 32 patients had epileptic seizures. We studied antibodies to tuberin and hamartin in CSF and serum both in patients and control group consisted from 112 healthy donors by similar ages. 18 patients underwent standard neurosurgical removal of brain TS hamartomas. 14 patients received experimental immunotherapy based on TOR activation.

**Results:** Tubers were found in 95% of TS patients. They were areas of focal cortical dysplasia with a reduced number of GABAergic neurons and are characterized by loss of the classical 6-layer cytoarchitecture of cerebral cortex. Tubers, single or multiple, ranging in size from few mm to several cm, were located above a single or several adjacent furrows. Tubers were calcified in 54% of cases. There was topographic relationship between the presence of focus on the EEG and the tuber revealed by MRI. The epileptic seizures originated in normal cortex surrounding tubers, which is the zone of "overexcited" neurons.

**Conclusions:** In many cases gene therapy shows a similar effect in TS treatment in comparison with traditional neurosurgical approach.

## Spine

ePoster presentation

Axis anatomy and dimensions relative to translaminar screw placement in Indian population

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**Objectives:** The purpose of the study was to provide the morphometric and radiological measurements in Indian population and to determine the feasibility of safe translaminar screw placement in this population.

**Background:** The technique of intralaminar screw placement for achieving axis (C2) fixation has been recently described. To the best of our knowledge there is no study (cadaveric or radiological) done in Indian population to detect suitability of axis bone for laminar screw fixation.

**Methods:** A total of 38 dry axis vertebrae from adult South Indian population were subjected to morphometric measurement and CT scan analysis.

**Results:** Middle 1/3rd lamina was the thickest portion (mean 5.17mm +/- 1.42mm). A total of 32 (84.2%) specimen were having midlaminar width in both lamina greater than 4 mm, however only 27(71%) out of them are having spinous process more than 9mm. CT scan measurement in middle and lower 1/3rd lamina was found to be strongly correlated with the direct measurement.

**Conclusions:** There is high variability in the thickness of the C2 lamina. As compared to western population, the axis bones used in the present study had smaller profiles. Hence the safety margin for translaminar screw insertion is low.

## Skull Base

Oral presentation

Use of microscope-based augmented reality (AR) for microsurgical resection of acoustic neurinomas

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**Objectives:** Microscope-based augmented reality (AR) is used for improved orientation in the operative field in skull base surgery, using superimposed images of segmented structures of interest in two-dimensional (2D) and three-dimensional (3D) manner.

**Background:** Use of AR for facilitation of resection of acoustic neurinomas (AN) has not been previously described.

**Methods:** All patients who underwent surgery for resection of acoustic neurinomas at our Department were included. Clinical outcome in terms of postoperative neurological deficits and complications was evaluated, as well as neuroradiological outcome for tumor remnants and recurrence.

**Results:** 42 patients (25 female, median age  $60.4 \pm 16.2$  years) who underwent resection of AN via retrosigmoid craniotomy with use of neuromonitoring (21 right sided, 14 giant tumors, 10 cystic, 7 with hydrocephalus) by single surgeon were included in the study with median follow up of  $45.8 \pm 33.6$  months. 18 patients underwent subtotal resection, 1 patient partial resection and 23 patients gross total resection. 26 patients underwent resection in sitting and rest in semi-sitting position. Out of 35 patients who had no facial nerve deficit prior to surgery, 19 patients were intact following surgery, 7 patients had House Brackmann (HB) Grade II paresis, 2 HB III, 6 HB IV and 1 HB V. Wound healing deficit with cerebrospinal fluid (CSF) leak occurred in 7 patients. 15 patients underwent resection using fiducial-based navigation and microscope-based AR, all in sitting position. Segmented objects in AR were sigmoid and transverse sinus, tumor outline, cranial nerves VII and V and brain stem. Operative time, clinical outcome and complication rate did not differ between the AR and non-AR group. However, use of AR improved orientation in the operative field for craniotomy planning and microsurgical resection by identification of important neurovascular structures.

**Conclusions:** AR improves intraoperative orientation and facilitates craniotomy planning and AN resection through early improved identification of important anatomical relations.

## Endovascular Neurosurgery

Oral presentation

Development and validation of a deep learning model to predict intracranial aneurysm instability: a multicenter, ambispective, longitudinal study

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**Objectives:** We introduce a novel deep-learning (DL) model for predicting risk stratification of UIA instability in clinical settings.

**Background:** Early management of patients with unstable (growth/rupture) unruptured intracranial aneurysms (UIAs) relies on timely risk stratification, and on prompt identification of treatment indications. Current prediction models are inadequate for this purpose.

**Methods:** We retrospectively collected UIA patients with longitudinal follow-up data from eight centers between January 2015 and December 2018 as our derivation cohort, and constructed a predictive model from it. We then created a validation cohort by prospectively recruiting patients from the same centers between January 2019 and December 2021. We defined aneurysm rupture or growth during follow-up as an unstable event. We obtained multidimensional risk factors relating to clinical, morphological, and hemodynamic parameters. We developed and validated the predictive model using these factors combined with deep hierarchical features of angiographic images, including parent artery characteristics of UIAs. Our model adopted the PointNet++ algorithm. We compared its performance with results from previous prediction score systems and machine learning models.

**Results:** We included 1096 patients with 1388 UIAs over a follow-up period of 2033 person-years (median 17.8 months). Of these, 148 patients (13.5%) and 153 aneurysms (11.0%) presented unstable UIAs, with an incidence of unstable event of 7.53 per 100 person-years. Our DL model produced an area under the receiver operating characteristics curve (AUC) of 0.94 for the derivation cohort, and 0.80 for the validation cohort. It achieved more robust, superior performance than representative prediction score systems and previous machine learning models (AUC values in the 0.40–0.76 range).

**Conclusions:** Our DL model, developed using a multicenter longitudinal follow-up dataset, supported effective assessment of UIA instability and outperformed previous models. It can therefore serve as a useful tool for clinical decision-making, and for achieving effective management of UIAs.

## Oncology

Oral presentation

### Sodium fluorescein guided resection of malignant brain tumours

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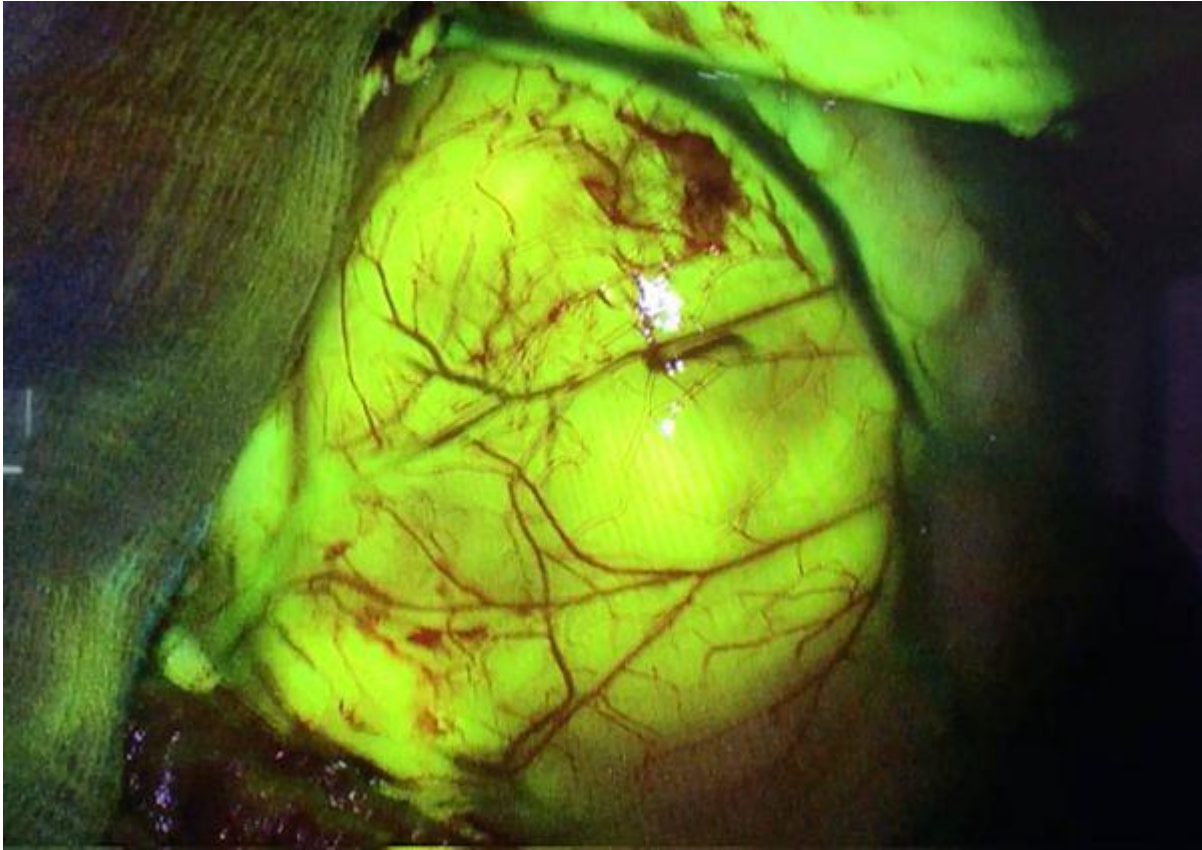
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**Objectives:** To study the effectiveness of Sodium Fluorescein dye induced fluorescence of Malignant Brain tumours in the extent of resection of the tumour.

**Background:** Malignant brain tumours are the commonest intracranial tumours includes Primary and Secondary (metastasis). Surgery is the first modality of treatment. Extent of resection and Maximal safe resection are important predictors of overall survival, progression free survival and neurological outcome.

**Methods:** Selection of cases - based on high grade malignancy features in MRI Brain Plain & Contrast study, Spectroscopy and age above 18 yrs. Total no of surgeries – 65, Period from August 2016 to May -2023. Fluorescein Sodium dye – 3-5mg/kg IV, 30-45 mts before craniotomy was given and fluorescence of the tumour was upto 4hrs. Under Pentero 900 microscope with yellow 560 filter, fluorescent tumour resection was done. Pre operative and Post operative tumour volume calculated using contrast MRI brain. Post operative MRI is usually done at 48 to 72hrs after micro neurosurgical resection of tumours.



**Results:** Extent of resection varies from 78% to 96%.Histo Pathological Report - Grade IV Glioma - 42 cases,Grade III Glioma- 6 cases, Metastasis – 17 cases.

**Conclusions:** Sodium Fluorescein can be used as a viable alternative to 5-ALA for intraoperative fluorescence guidance in adult malignant brain tumor surgery. Comparative, prospective, and randomized studies are much needed. 5-ALA fluorescence-guided surgery has shortcomings such as drug's phototoxicity, extortionate price, the need to switch between blue light (for identification of fluorescent tissue) and white light (to delineate the anatomy of the nonfluorescent tissue and vessels for coagulation) frequently during surgery,

## Neurovascular Surgery

ePoster presentation

Demographical domains and clinico-radiological characteristics of study cohorts with simultaneous multiple intracerebral hemorrhages in a tertiary neurosurgical center in Nepal

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**Objectives:** Spontaneous simultaneous multiple intra-cerebral hemorrhages (SMICHs) and their occurrences in different territories of arterial disposition have been viewed as uncommon clinical occurrences since the pathophysiological and predisposing factors as mechanisms aren't vividly defined. This research primarily aims for demographic stratification and dichotomization pertaining to risk factors, etiological classifications, anatomical distributions, and outcome analysis by focusing on management strategies and appropriate stroke care.

**Background:** Among ICH patients, approximately 5% (1:20) have been identified as SMICHs. Stroke ripples affect patients with a continuum of multi-spectral consequences. Literature scarcity pertaining to spontaneous SMICHs paves the way for further research on the entity. Better knowledge and in-depth information about the incidence and patterns of spontaneous SMICHs can help formulate treatment algorithms and provide newer reforms in the patient management system.

**Methods:** 40 patients presenting to the College of Medical Sciences, Chitwan, Nepal in the last two years were included in the study. The patients with two or more spontaneous SMICHs with affected arterial territories with similar tomographic density-based profiling were chosen as samples. Regression analysis was selected to test three hypotheses.

**Results:** Among our study cohorts, cortical and cortical territory (60%) were the major anatomical patterns of involvement. A conservative approach was undertaken in nine patients (22.5%), whereas surgical intervention was needed in five others (12.5%). 14(35%) patients left against medical advice and seven (17.5%) were referred for adjuvant oncologic care. Mortality was observed among five (12.5%) patients. Hypertension was seen as a significant variable in its pathogenesis. Male patients were more affected. Age groups comprising 36-45 years and 56-65 years were involved in 32.5% and 30% of cases respectively.

**Conclusions:** This study proves the need for a national stroke data bank pertaining to spontaneous SMICHs. This will help foster effective patient education during preoperative counseling; as well as formatting a management algorithm combating them.

## Neurovascular Surgery

ePoster presentation

Mini craniotomy in the management of supratentorial spontaneous intracranial hemorrhage: a single-center outcome of the minimally invasive treatment

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**Objectives:** We herein performed a study on the role of a mini craniotomy open surgical method of evacuating hematoma in selected patients with supratentorial intracerebral hemorrhage.

**Background:** Surgical evacuation of hematoma has the advantage of rapidly controlling the increased intracranial pressure, halting the ongoing herniation syndrome, and mitigating the secondary cascades of events mediated by the inflammatory and blood degradation products. The advantage is hindered by the concurrent insult to the healthy brain tissue while passing through the normal brain tissue.

**Methods:** We herein performed a study on the role of a mini craniotomy open surgical method of evacuating hematoma in selected patients with supratentorial intracerebral hemorrhage. We found a significant reduction in the surgery length, minimized risk of post-surgery complications, shortened intensive care unit stay, and reduced mortality compared to full-fledged craniotomy and endoscopy-guided surgery.

**Results:** We found that 81 out of the 130 ICH patients reviewed in the study were referred. We further show that the classifiers to be considered most in the decision-making on the patient referral are as follows: hematoma volume, midline shift found in radioimaging, the ventricular extension of bleeding, and appearance of hydrocephalus. An improper referral of the patient to the tertiary care center decreases the limited resources of healthcare services in low-income countries. We believe the study reflects a prevailing belief among healthcare professionals that the current referral system could be improved with the inception of the "hub and spoke" model of healthcare. In this model, a network of secondary health institutions, capable of offering limited treatment, would refer ICH patients to an anchor tertiary institution, respecting the proper dichotomization of patients based on the clinical classifiers.

**Conclusions:** There is a need for a large-scale randomized multicenter prospective study to verify the advantages of minimally invasive approaches in the management of symptomatic supratentorial intracerebral hemorrhages.



## Trauma

Oral presentation

Reliability of magnetic resonance tractography in predicting early clinical improvements in patients with diffuse axonal injury grade III

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**Objectives:** This study seeks to determine differences in the fractional anisotropy (FI) and diffusion-weighted image (DWI) values obtained from the seeds placed at an appropriate region of interest (ROI) within the magnetic resonance (MR) tractography of the brainstem of brain-injured patients.

**Background:** Diffuse axonal injury (DAI) grade III forms a distinct subset of traumatic brain injury wherein it is difficult to predict the outcome and the time taken for early recovery in terms of sustained eye opening and standing with minimal assistance.

**Methods:** We determined the differences between the lesion and the corresponding half in fractional anisotropy. We also calculated the differences between the DWI value in the rostral-caudal region along the corticospinal tracts and the affected tracts and the values obtained from the seeds placed in the region of interest (ROI). The acquisition of DTI was done to visualize any compression, discontinuity, abrupt termination, or tract wasting. The number of days it took from brain damage to spontaneous and sustained eye-opening and the time required for weight-bearing on a dysfunctional body part, with minimal external support, were recorded for each patient.

**Results:** We found that differences in the DWI values along the corticospinal tract were associated with the days required for early recovery. Moreover, dysautonomia was an independent variable governing a delayed recovery in these patients. The lesions posterior to the corticospinal tract in the brainstem conferred increased odds for the subsequent development of dysautonomia.

**Conclusions:** We conclude that MR tractography, in addition to depicting the anatomical integrity of the concerned tracts, has the potential of becoming a surrogate clinical imaging marker for effectively predicting days for early recovery among patients with DAI grade III.

## Trauma

ePoster presentation

### Prognostics of hospitalization length and mortality in patients with traumatic frontal brain contusions

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**Objectives:** In this study, we evaluated the prognostic role of demographic and clinical-radiological variables on hospitalization length and mortality in 71 of patients with frontal brain contusions.

**Background:** Traumatic brain injury has a ripple effect on the physical, cognitive, behavioral, and emotional domains of quality of life and portends a long-term neurological disability in survivors.

**Methods:** The receiver operating characteristic (ROC) plots were performed, with area under the curve (AUC) values, for a graphical comparison of variables that would predict mortality and hospitalization length.

**Results:** We found that the best prognostics of mortality were the Glasgow Coma Scale score, the motor function score, and the Rotterdam CT score, with AUC values of 0.873, 0.836, and 0.711, respectively. Concerning the prediction of hospitalization length, the AUC showed inappreciable differences, with the highest values for the Glasgow Coma Scale score, Rotterdam CT score, and the serum cortisol level in the 0.550-0.600 range. Curve estimation, based on multivariate analysis, showed that the scores of motor function, Glasgow Coma Scale, and Rotterdam CT correlated best with the prediction of both mortality and hospitalization length, along with the upward dynamic changes of serum cortisol for the latter.

**Conclusions:** We conclude that basically simple and non-invasive assessment in survivors of acute traumatic brain contusion is helpful in predicting mortality and the length of hospital stay, which would be of essential value in better allocation of healthcare resources for inpatient treatment and rehabilitation and for post-hospital patient functioning.

## Education, Ethics, Socioeconomic

ePoster presentation

Multi-spectral pattern of clinical presentation and the resultant outcome in central nervous system tuberculosis: a single center study

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**Objectives:** This review article describes the clinical presentation of CNS TB in a group of 47 patients, who were managed at the Nobel Medical College and Teaching Hospital in Biratnagar, Nepal during the last 2 years.

**Background:** Central nervous system (CNS) tuberculosis (TB) is a great medical masquerader having a multi-spectral pattern of clinical presentation, thereby complicating early diagnosis and appropriate management.

**Methods:** We evaluated the demographic profiles, modes of management, and clinical outcomes of these patients.

**Results:** The findings were that intracranial TB was present in 27 (57.5%) patients and spinal involvement were in 20 (42.5%) patients. The most frequent presentation of the former was TB meningitis with hydrocephalus (55.5%) and that of the latter was Pott's spine with an abscess in 50% of cases. TB meningitis with hydrocephalus was the commonest cause of mortality (83.3%) among the patients.

**Conclusions:** CNS TB should be considered in the differential diagnosis in patients presenting with equivocal neurological signs and symptoms, especially in TB endemic regions. It seems prudent to commence early antitubercular therapy for safeguarding such patients from the poor neurological outcomes as well as mortality it harbingers.

## Oncology

ePoster presentation

### Seizures in patients who underwent excision of meningioma: a retrospective single-center study on possible risk factors

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**Objectives:** This retrospective study evaluated possible predisposing factors to developing seizures among patients who underwent excision of meningioma.

**Background:** Prescribing prophylactic antiepileptic drugs among meningioma patients identified to have a high risk of developing epileptic seizures may lead to better postoperative outcomes and quality of life. However, prescribing to patients who are low risk may cause adverse effects and unnecessary expenses. Therefore, the American Academy of Neurology recommends AED use only in patients with a definitive history of seizures. The decision on whether to start prophylactic antiepileptic drugs among seizure-naïve meningioma patients remains a debate and is left to the attending neurosurgeon's discretion.

**Methods:** The author gathered and reviewed 81 cases of meningioma at a tertiary hospital throughout 2016-2020. Pertinent data collected are patient's age and gender, tumor location, tumor laterality, tumor size, presence of peritumoral edema on imaging, tumor grade, previous surgical resection, operative duration, estimated blood loss, and extent of resection. All data were analyzed using statistical methods to determine significant risk among patients who developed seizures.

**Results:** Seizures occurred in 27 (33.3%) patients. 22 (81.4%) presented preoperatively while 5 (18.5%) manifested postoperatively. Tumor size  $\geq 3.5$  cm (p 0.016, OR 6.25), motor cortex involvement (p 0.045, OR 3.08), and peritumoral edema (p 0.037, OR 8.72) were associated with a higher risk of seizures. Preoperative AEDs were effective in preventing seizure recurrence postoperatively among the 22 patients who had preoperative seizures.

**Conclusions:** Tumor size  $\geq 3.5$  cm, motor cortex involvement, and peritumoral edema on preoperative imaging are predisposing factors to developing seizures. Preoperative antiepileptic drugs effectively prevented postoperative seizures in the majority of patients, even in those who have a history of preoperative seizures. Other factors that may have played a role in postoperative seizures include tumor size, tumor grade, prolonged operative duration, higher amount of blood loss, and extent of resection.

## Oncology

ePoster presentation

### Seizures in patients who underwent excision of meningioma: a retrospective single-center study on possible risk factors

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**Objectives:** We performed a systematic review to examine the unique surgical indications for staging, timing between stages, specific surgical approaches employed, and postoperative complications of staged surgery for primary intra-axial neoplasms.

**Background:** Staged surgery for skull base lesions has been utilized to facilitate maximal safe resection and optimize outcomes while minimizing morbidity and complications. Conversely, staged surgery for primary intraparenchymal neoplasms is less commonly performed and has not been reported as extensively within the literature.

**Methods:** A literature search was conducted using PubMed, Web of Science, and Cochrane databases using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) recommendations. Titles and abstracts were evaluated independently by two authors, after which articles were selected for final analysis based on application of strict inclusion criteria during full text screen. Each included article was then qualitatively assessed and relevant variables, including operative approaches, timing, and outcomes, were extracted for synthesis.

**Results:** Of 115 results, 10 articles were included for analysis and consisted of 18 pediatric and 4 adult patients. Staged approaches were more commonly utilized in the pediatric population for resection of astrocytoma and glioma. Pediatric patients had timing of surgeries ranging from 5 days to several weeks between operations, compared to between 18 days and 4 months in adult patients. Complications in pediatric patients were most commonly hemiparesis and homonymous hemianopsia, hydrocephalus, CN VI and VII palsies, truncal ataxia, and cerebellar mutism, while complications in adult patients included language and abstract thinking deficits, respiratory failure, and motor weakness.

**Conclusions:** This study reports the first comprehensive review of staged surgical procedures for primary, intra-axial cranial neoplasms. There exists a large degree of heterogeneity in complications resulting from staged surgeries for intra-axial neoplasms, which are similar to complications associated with single-stage surgery for intraparenchymal lesions as well as multi-stage surgeries for skull base lesions.

## Skull Base

ePoster presentation

Outcomes following Endoscopic Endonasal (EEA) transphenoidal approach for resection of craniopharyngioma: cerebrospinal fluid leak in pediatric versus adult patients

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**Objectives:** To compare postoperative CSF leak rates between pediatric and adult patients following EEA for resection of craniopharyngiomas.

**Background:** Cerebrospinal fluid (CSF) rhinorrhea is a serious complication following endoscopic endonasal approach (EEA) for resection of craniopharyngioma.

**Methods:** The Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines were used to query the PubMed, Web of Science, and Cochrane library databases to identify studies of craniopharyngioma resection in adult or pediatric patients from the past three decades. The primary outcome variable collected was CSF leak rate. Pooled analyses were performed to determine the rates of CSF leak in adult and pediatric cases. In addition, a meta-analysis was performed to compare the rates of CSF leak in adult and pediatric cases.

**Results:** Of the 483 abstracts reviewed, 93 studies were screened, of which 21 met eligibility criteria. Eight studies reported adult cases, 10 reported pediatric cases, and 4 reported both adult and pediatric cases. The majority of studies were level 4 evidence (90.9%, 20/22), while two studies were level 3 evidence (9.1%, 2/22). The included studies reported a total of 510 patients who underwent craniopharyngioma resection. Analysis of postoperative CSF leak in adult and pediatric cases revealed a rate of 26.9% (95% CI: 15.3%-47.1%) and 13.4% (95% CI: 9.4%-19.0%), respectively. Using a random-effects meta-analysis model, we found that there was no significant difference between the two cohorts (RR: 1.56; 95% CI: 0.52-4.71; P = 0.43).

**Conclusions:** The present study is the first to comparatively assess rates of postoperative CSF rhinorrhea in adult and pediatric patients undergoing EEA for resection of craniopharyngiomas. While we found that there is no significant difference in rates of postoperative CSF rhinorrhea between adult and pediatric patients, further studies of higher methodological quality are warranted to provide a better understanding of complication profiles following resection of adult and pediatric craniopharyngioma.

## Oncology

ePoster presentation

### 27 unique machine learning algorithms: assessment of the current applications of predictive modeling and deep learning for GBM prognostication

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**Objectives:** The objective of the present review is thus to assess recent advancements in ML for GBM through a systematic search of the literature.

**Background:** Glioblastoma multiforme (GBM) is the most common primary malignant brain tumor in the United States, accounting for approximately 56.6% of all gliomas and 47.7% of all primary malignant CNS tumors. The prognosis of GBM is notably grim, with a 1-year relative survival rate of 41.4% and a 5-year survival rate of 5.8% following diagnosis. Recent efforts to identify potential therapeutic targets have utilized tumor omics data integrated with clinical information that leverages machine learning (ML) algorithms. However, there remains a paucity of studies assessing the value of these ML models as prognostic tools in GBM.

**Methods:** A systematic search adhering to PRISMA guidelines was conducted to identify all studies describing the use of a ML algorithm involving GBM metabolic biomarkers and each algorithm's accuracy.

**Results:** Ten studies were included for final analysis. They were diagnostic (n=3, 30%), prognostic (n=6, 60%), or both (n=1, 10%), respectively. Most studies analyzed data from multiple databases, while 50% (n=5) included additional original samples. At least 2,536 data samples were run through a ML algorithm. 27 ML algorithms were recorded with a mean 2.8 algorithms per study. Algorithms were supervised (n=22, 79%) or unsupervised (n=6, 21%), and continuous (n=21, 75%) or categorical (n=7, 25%). The mean reported accuracy and AUC of ROC was 95.63% and 0.779, respectively. 106 metabolic markers were identified, but only EMP3 was reported in multiple studies.

**Conclusions:** Many studies have identified potential biomarkers for GBM diagnosis and prognostication. These algorithms show promise; although, a consensus on even a handful of biomarkers has not been made. An integration of ML algorithms for biomarker detection combined with radiomics-based tumor imaging will be necessary to ascertain the greatest level of accuracy and precision.

## Trauma

ePoster presentation

Decompressive craniectomy following severe traumatic brain injury with an initial Glasgow coma scale score of 3 and 4

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**Objectives:** Demonstrate the usefulness of the wide adequate decompressive craniectomy in patients with severe traumatic brain injury and Glasgow coma scale score of 3 or 4.

**Background:** Decompressive craniectomy formed as surgical management option for severe traumatic brain injury (TBI). Few studies that follow the TBI patients with a Glasgow coma scale (GCS) score of 3 or 4. Decompressive craniectomy was avoided in these patients due to the poor outcomes and the worse functional recovery.

**Methods:** Two patients were presented in our case series. The first one suffered of severe TBI following an aggression with a Glasgow coma scale (GCS) score of 3/15 and bilaterally dilated unreactive pupils. A brain CT-scan showed right frontal fracture, bifrontal hematoma contusion, a fronto-temporo-parietal acute subdural hematoma (SDH) with a thickness of 14 mm on the right side, traumatic subarachnoid hemorrhage, with 20 mm of midline shift to the left side, diffuse brain edema. The second one presented with severe TBI following an automobile accident with a GCS score of 4/15 and iso-reactive pupils. A brain CT-scan showed bilateral fronto-temporal fracture, diffuse brain hematoma contusion, traumatic subarachnoid hemorrhage, right extradural hematoma (EDH) and bilateral fronto-temporo-parietal acute subdural hematoma (SDH) more important in the right side.

**Results:** Our case series suggest that the wide adequate decompressive craniectomy in patients with severe TBI and GCS score of 3 or 4 can be performed and useful to obtain good long-term neurological outcomes with a good functional recovery.

**Conclusions:** The rapidity of the surgical indication decision can be option to obtain the better neurological outcomes.



## Oncology

Oral presentation

### Computational neuroscience in neurosurgery

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**Objectives:** To illustrate the developed pipeline able to implement an automatic analysis of multimodal MRI (such as diffusion tensor imaging, adjacent matrix and connectomics) for presurgical mapping.

**Background:** Computational neuroscience (CNS) refer to an interdisciplinary approach for development, simulation, and analysis of multi-scale models and theories of neural function. However, image analysis requires different software packages, mainly developed for research purposes and often difficult to use in a clinical setting, preventing large-scale diffusion of presurgical mapping.

**Methods:** 70 patients with MRI diagnosis of either low and high grade glioma has been enrolled in this study. In the first step, high-resolution anatomic images were processed using FreeSurfer to obtain a subject-specific parcellation of each subject's brain into 68 cortical regions of interest (ROIs) (34 per hemisphere). T1-weighted data of all subjects were subjected to the default recon-all processing pipeline. Then with Python script all brain tractography was analyzed and adjacency matrix and connectome were created. Each patient underwent a surgical procedure tailored according the data analysis in order to obtain the maximal safe removal considering also the oncofunctional outcome.

**Results:** The gross total removal range from 80% to 100%. The only complication reported are 2 CSF fistula. In the group of patients harboring lesion in the right temporal lobe, where for radical purposes a temporal lobectomy has been done, a transient euphoric mood appeared. A professional musician with a left high grade glioma after the excision switched from playing jazz to melodic sounds.

**Conclusions:** Thanks to this workflow it is possible to transfer the results to the neuronavigator in the operative room setting. An advantage of using whole brain tractography imaging is that it allows to investigate the large scale effect of surgery and the reorganization of the brain mainly in eloquent low and high grade gliomas.

## Spine

Oral presentation

### Risk factors for fusion failure in children undergoing occiput to C2 rigid instrumentation and fusion

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**Objectives:** The purpose of this study was to identify risk factors for fusion failure among children undergoing occipital to C2 instrumentation and fusion.

**Background:** Modern studies investigating outcomes after pediatric occipital-cervical fusions have mostly been limited to small or single center evaluations. Failure rates have been reported as high as 20%, with significant clinical variation among pediatric spine surgeons.

**Methods:** The Pediatric Spine Study Group (PSSG) registry was queried to identify patients  $\leq 21$  years old who underwent occiput-C2 posterior spinal rigid instrumentation and fusion and had two year minimum clinical and radiographic follow-up (lateral radiograph or CT scan). Clinical, radiographic, and surgical variables were investigated. The primary outcome was fusion failure, defined by hardware revision ( $> 30$  days) or radiographic screw haloing or device failure.

**Results:** 74 patients were included in the study (median age 9 years; 51% male). The most common etiologies included syndromic (55%) and congenital (20%). Fusion failure was identified in 28/74 (38%) patients, with 13/74 (18%) undergoing revision and 15/74 (20%) with screw haloing or breakage. Univariate analysis demonstrated that the use of structural rib autograft ( $p = .02$ ) and postoperative immobilization with a hard collar ( $p = .04$ ) were associated with lower rates of fusion failure. Multivariable logistic regression analysis showed that patients with rib autograft had a 75% reduction in the odds of fusion failure (OR=0.25; 95% CI=0.08-0.75;  $p=0.01$ ). Age, etiology (including Down syndrome), instrumentation type, unilateral instrumentation, and other variables were not associated with fusion failure.

**Conclusions:** In this multicenter, multidisciplinary, international registry of children undergoing occipital to C2 instrumentation and fusion, a high rate of fusion failure (38%) was seen, likely due to the high frequency of syndromic and congenital etiologies. Use of structural rib autograft was associated with a 75% decrease in the odds of fusion failure.

## Oncology

Oral presentation

### Resection of the cavernous sinus medial wall improves remission rate in functioning pituitary tumors: retrospective analysis of 248 consecutive cases

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**Objectives:** To evaluate the effects of the medial wall of cavernous sinus (MWCS) resection during functioning pituitary tumor (FPT) surgery.

**Background:** CS invasion is the most unfavorable factor affecting surgical outcome in FPTs.

**Methods:** Consecutive 248 FPTs (134 somatotroph tumors, 70 corticotroph tumors, 35 lactotroph tumors, and 9 thyrotroph tumors) were operated on between April 2018 and December 2021. They were classified into 3 groups as follows: Group A (91 cases): No clear MWCS invasion. No direct tumor contact with MWCS. Group B (102 cases): Possible wall invasion. Direct tumor contact with MWCS and it is difficult to judge whether MWCS is infiltrated by the tumor itself. Group C (55 cases): Clear CS invasion. There is an apparent tumor CSI. Aggressive MWCS resection was performed in all 102 patients belonging to Group B.

**Results:** Overall complete remission (CR) rates of group A (87%) and B (94%) were significantly higher than group C (25%) but CR rates between A and B were not significantly different. MWCS invasion was histologically examined and confirmed in at least 57% of patients with possible wall invasion (Group B), indicating that 57% of the patients in Group B would not have achieved remission if aggressive medial wall resection was not performed. Moreover, MWCS invasion was found even in tumors with Knosp grade 0 (43%) or 1(65%), suggesting that MWCS invasion cannot always be predicted from Knosp grading alone. There were no complications related to aggressive resection of MWCS in this series.

**Conclusions:** MWCS invasion occurred in at least 57% of patients with possible wall invasion and MWCS resection could contribute to improve the overall CR rate. Active resection of MWCS is therefore recommended whenever invasion of the tumor into MWCS cannot be confidently denied.

## Global Neurosurgery

ePoster presentation

Surgical treatment modalities for colloid cysts in the third ventricle. Algorithms for an up-to-date treatment planning

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**Objectives:** Colloid cysts of the third ventricle are relative rare and benign lesions. Mainly, three different surgical procedures are available for their treatment: stereotactic puncture and aspiration, endoscopic and microsurgical resection. However, there are various strategies and approaches to perform these procedures.

**Background:** The evaluation provides pros and cons of the surgical methods and the different approaches with regard to the individual situation.

**Methods:** Totally, 28 patients with colloid cysts are evaluated in a retrospective study. For all surgical procedures (endoscopy and microsurgery) preoperative approach planning was performed by 3D visualization and intraoperative orientation with a navigation system (BrainLab, Germany). Following parameters determine the decision algorithm: size and exact localization of the cyst, lateralization, acute or chronic hydrocephalus (intracranial pressure), size of the ventricles (ventricular index), symmetry or asymmetry of the ventricles, anatomy of the corpus callosum, size of the foramen of Monroi.

**Results:** Totally, 7 patients were treated with endoscopic resection and 21 patients with microsurgical resection (in 6 patients a transcortical transforaminal approach, in 12 patients a transcallosal transforaminal approach, in 2 patients a transcallosal subchoroidal approach, and in 1 patient a transcallosal interforaminal approach). No personal experience with a stereotactic puncture and aspiration.

**Conclusions:** The paper provides following algorithms for the surgical decision making in colloid cysts of the third ventricle. In patients with acute hydrocephalus and elevated ICP – endoscopy or microsurgery transcortical. In patients with thin corpus callosum – microsurgery transcallosal. In patients with small ventricles – microsurgery transcallosal. In patients with large ventricles - endoscopy or microsurgery transcortical. In patients with small foramen of Monroi- microsurgery intraforaminal or subchoroidal.

## Spine

Oral presentation

Navigated spinal spondylodesis using intraoperative cone beam CT imaging - experience after more than 100 consecutive surgical cases

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**Objectives:** Intraoperative navigation and imaging is the future in spine surgery. The accuracy of the placement of the pedicle screws on both the lumbar and cervical spine can be improved a direct radiological control can be achieved by means of intraoperative imaging with the cone beam CT (CBCT).

**Background:** As the first clinical installation in Germany, the navigated cone beam CT (LoopX, BrainLab) has been in use since December 2021. System evaluation and error analysis was carried out prospectively.

**Methods:** At present, over 100 spinal transpedicular fixation procedures were performed. All screws were planned using the BrainLab navigation software and inserted navigation-guided and intraoperatively controlled by CBCT. The intraoperative workflow is presented and the advantages of navigated spondylodesis combined with intraoperative imaging are evaluated.

**Results:** The whole system can be fully operated externally with a tablet, by the surgeon itself. Of all lumbar pedicle screws placed, 8 screws required revision in the first intraoperative scan. After direct correction of the screws as part of the intervention, no pedicle screw required revision. Totally, 14 of the cervical pedicle screws showed an incorrect position. This can be explained as user error of the initial learning curve. Intraoperative technical problems with the CBCT or the navigation could be solved in all cases. Clinically, there were no new focal neurological deficits postoperatively.

**Conclusions:** The navigated and LoopX-guided spondylodesis using percutaneous pedicle screws represents an optimization of the minimally invasive lumbar stabilization, as well as for the dorsal cervical fusion. The high-quality CBCT display of the implanted screws allows a reliable and timely assessment of the implants intraoperatively. Due to the integration into the entire navigation workflow, this intraoperatively acquired data set can be used directly to plan an intraoperative revision in the event of a malposition.

## Endovascular Neurosurgery

ePoster presentation

Incidental aneurysms in the South Colombian region: characteristics and location

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**Objectives:** To determine the main characteristics of aneurysms found incidentally (without rupture) in patients from the South Colombian region.

**Background:** Intracranial aneurysms have a high mortality rate when rupture occurs and cause subarachnoid hemorrhage. There is still no consensus on the relationship between size and risk of rupture, therefore. We present a case series of incidental findings of aneurysms to analyze their main characteristics.

**Methods:** A retrospective approach study was performed, in which the imaging findings of patients with incidental diagnosis of aneurysm between 2011 and 2020 in the South Colombian region were reviewed.

**Results:** 177 cases of patients with unruptured aneurysms were found. The average age was 58.82 years (SD 16.4) with a higher frequency of cases in women (72.3%). The average major diameter was 12.55mm (SD 7.73) and the average neck extension was 3.06mm (SD 0.718). The most frequent location was the posterior communicating artery (39.5%) followed by the middle cerebral artery (32.8%).

**Conclusions:** The data obtained are consistent with studies indicating that aneurysms with less risk of rupture are those of larger size (diameter) and larger neck (greater than 3mm). Similarly, it is confirmed that these aneurysms with low risk of rupture are located in arteries with lower blood flow velocity.

## Hydrocephalus

ePoster presentation

Intravenous dislocation of a ventriculo-atrial catheter: a rare case

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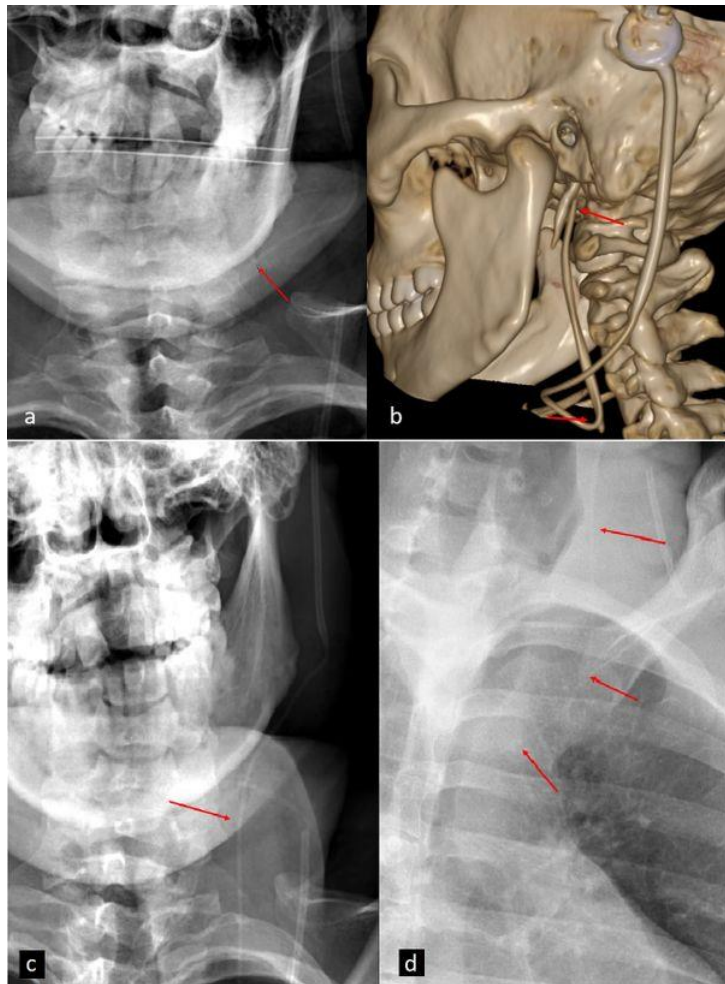
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**Objectives:** Present an extremely rare complication of a ventriculo-atrial (VA) shunt.

**Background:** VA shunt-insertion is a common procedure to treat hydrocephalus, if ventriculo-peritoneal (VP) shunt placement is not possible. Complications of VA shunt-insertion include infections, thromboembolic complications, catheter dislocation, and exacerbation of pulmonary hypertension.

**Methods:** We present a 24-year-old patient with spontaneous intravenous dislocation of the atrial catheter after initial VA shunt placement 11 months prior. His medical history includes a neonatal posthemorrhagic hydrocephalus with immediate VP shunt insertion as a newborn and multiple revision surgeries over the past decades including conversion from a VP- to a VA-Shunt system in 01/2022.

**Results:** The patient presented with acute symptoms of increased intracranial pressure with less than 24 hours of onset. The cranial CT-scan showed an enlargement of the ventricles compared to prior images. The radiographs of head and chest revealed a dislocation of the atrial catheter. The CT scan of the neck revealed a double flexion of the distal catheter within the vein turning first up into cranial direction and then back into caudal direction at the jaw angle. (See image;(a) X-ray and (b)CT-scan reconstruction of the catheter dislocation). Revision surgery with placement of a new atrial catheter was performed with an uneventful postoperative course and correct placement of the catheter. (Image Figure; (c) and (d) X-rays after revision surgery showing the correct position of new catheter).



**Conclusions:** Intravenous dislocation of a VA shunt is a rare complication. An intravenous flexion of the distal catheter of VA-shunt has not been reported so far. The underlying pathophysiological mechanism remains unclear. Implantation of the catheter into a big vein might contribute to the risk of dislocation by giving the catheter space to move within vessel presumably due to changes in the central venous pressure and/or intracranial pressure.



## Skull Base

ePoster presentation

Navigation and endoscopic removal of third ventricle colloid cyst: first experience as young neurosurgeon

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**Objectives:** To show how a young neurosurgeon performed his first endoscopic removal of colloid cyst and what troubles one faces during performing it.

**Background:** Colloid cysts are a relatively rare benign cystic lesion originating from brain endodermal embryonic remnants, most commonly occurring in the rostral portion of the third ventricle, immediately adjacent to the interventricular Foramen of Monro. Symptomatic patients usually present with obstructive hydrocephalus due to a blockage of cerebrospinal fluid pathways around the FM.

Higher rates of gross total resection reported on the microsurgical series are associated with increased morbidity and lower recurrence. Differently, endoscopic surgery, which was once akin to lower chances of GTR and recurrence, has been, over the past decade, related to progressively better results in these matters.

**Methods:** 41/f presented with history of intense headache on and off with Increased fatigue, No Vomiting/Nausea, No H/O Memory loss, No H/O Hormonal dysfunction No H/O Visual Dysfunction. CT brain was done which showed third ventricle colloid cyst. after proper investigation and fitness navigation guided endoscopic removal of colloid cyst was done.

**Results:** For few days EVD was kept and when the flow was minimal it was removed. patient recovered fully and headache subsided.



**Conclusions:** Gross total resection may not be the main objective for every situation. Subtotal resection without capsule removal seems to be safer while preserving good results, especially in a limited resource environment. Remnants left behind should be followed but tend to remain clinically asymptomatic for the most part. Surgical planning allows the surgeon to choose among the different resection routes and techniques available. Decisions are predominantly based on preoperative imaging and intraoperative findings.

## Peripheral

ePoster presentation

### Motor recovery in different types of brachial plexus injury surgeries

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**Objectives:** Contrast the efficiency of motor recovery in the different types of brachial plexus injury surgeries. Highlight the importance of increasing the level of evidence and methodological rigor on the literature related to brachial plexus injury surgeries.

**Background:** Brachial plexus injuries (BPI) affect mostly the young working population. The management of these injuries is complex and there are many surgical options for treatment that depend on the clinical manifestations of the patients.

**Methods:** A systematic review was carried out according to PRISMA guidelines (PROSPERO ID: CRD42022296184), Advanced search in PubMed was performed using the Mesh terms "brachial plexus injury", and "surgery" as a subtopic. The result was 2153 articles that reported clinical outcomes in different types of surgeries (neurolysis, nerve transfer, nerve graft, end-to-end, multiple interventions and others). The clinical data for eligibility focused on collecting motor, sensory and functional recovery.

**Results:** Thirty-eight articles were included for the quantitative analysis. There were 34 retrospective studies (including 11 case series) and 4 prospective non-controlled, non-randomized studies. Location of the injuries was represented to be mostly infraclavicular in 70.86% of the cases affecting cords or terminal branches of the brachial plexus at high level of injury.

**Conclusions:** All the surgical techniques are effective for motor recovery. It is necessary to reassess the techniques that have been displaced over the time (surgical neurolysis and end-to-end suture) added to the popularization of new techniques (nerve transfer and muscle/tendon transfer). Conversely, these results highlight the need to increase the level of evidence and methodological rigor on the literature related to brachial plexus surgery, carrying out well-powered, well-controlled, and well-randomized studies to have clearer knowledge about the precise indications of each one of these surgical alternatives in the management of BPI.

## Oncology

Oral presentation

### Surgical outcome of medulloblastoma in Ethiopia

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**Objectives:** To assess surgical treatment outcome and prognostic factors in patients diagnosed with medulloblastoma in terms of overall and progression free survival probabilities and performance status.

**Background:** Medulloblastoma is one of the commonest central nervous system tumors in pediatric patients and is relatively rare in adults. Despite remarkable improvement in diagnosis, the high success rates of its management documented in the western world are not exactly mirrored in middle and low income countries, like Ethiopia, due to various socio-economic factors and health-care disparities.

**Methods:** Retrospective study involving twenty-seven patients (21 pediatrics & 6 adults) who underwent surgery for medulloblastoma (January 1, 2010-April 30, 2018), at two neurosurgical centers. Structured questionnaire was used to collect patients' data & surgical treatment outcome variables were assessed by suitable statistical tests.

**Results:** 6-month and one-year overall survival probabilities were estimated as 41% and 29% respectively with a median survival time of 107 days (95% CI: 49,166). Median survival time was 66 days (95% CI: 27, 105), with 6 months and one-year survival rate of 24 % (p=0.031) for pediatric patients. More than half (61.90%) of pediatric deaths were encountered in the first two months of surgery. Overall 6 months & one-year PFS probabilities were around 83% and 44% respectively with median PFS of 9 months (95%CI: 7, 12). Younger age at presentation, postoperative open EVD & longer SICU stay, lack of radiation treatment and the presence of complications post-intervention or upon follow-up were some of the negative outcome predictors found in this study.

**Conclusions:** Overall median and PFS of operated patients <15 years old is poor. Patients with negative outcome predictors have higher mortality & poor postoperative functional status. Standardization of treatment with surgery & Craniospinal Irradiation ± chemotherapy yields longer survival rates in both pediatric and adult patients.

## Spine

ePoster presentation

Transvertebral excision of cervical intradural extramedullary lesion

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**Objectives:** Transvertebral excision of anteriorly located intradural and extramedullary lesion of the cervical spinal cord.

**Background:** Intradural extramedullary lesion usually located laterally or posterolaterally and makes removal easy from posterior approach. If tumor is located completely anteriorly and excision through anterior transvertebral should be considered.

**Methods:** 40years old gentleman presented with history of weakness of all 4limbs since 6months. Weakness was insidious in onset and gradually progressive and more on left side and was able to walk with support only. He was evaluated with MRI cervical spine which showed contrast enhancing lesion, located anterior to the spinal cord from C5 to C7 and compressing it. He underwent anterior cervical (trans vertebral) approach with C5-7 corpectomy and total excision of lesion and fusion with cage and plate.

**Results:** Post operatively patient had significant improvement in power of the limbs and able to walk without support. Histopathological examination of the lesion revealed as Schwannoma.

**Conclusions:** Lesions located anterior to the spinal cord can be excised safely with trans vertebral approach without injuring the cord.

## Hydrocephalus

ePoster presentation

ETV first experience as young neurosurgeon

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**Objectives:** To tell my experience of endoscopic third ventriculostomy as young neurosurgeon.

**Background:** ETV is considered as a treatment of choice for obstructive hydrocephalus.

**Indications are:**

hydrocephalus secondary to congenital aqueductal stenosis,  
posterior third ventricle tumor,  
cerebellar infarct,  
Dandy-Walker malformation.

**Points in mind while going for ETV:**

Proper Pre-operative imaging for detailed assessment of the posterior communicating arteries distance from mid line, presence or absence of Liliequist membrane or other membranes, located in the prepontine cistern is useful. Intraoperative observations of the patent aqueduct and prepontine cistern scarring are predictors of the risk of ETV failure.

Such patients may be considered for shunt surgery.

**Methods:** 55/M presented with features of raised Intracranial pressure. on examination he had Pineal gland tumor with Hydrocephalus. patient underwent ETV followed by surgery of tumor.

**Results:** patient's headache was relieved after ETV.

**Conclusions:** there are many methods of treating hydrocephalus like, shunts, programmable shunts but best way is ETV. before performing ETV, one should be fully trained, observed many cases, should have Landon's practice and then perform it.

## Neurovascular Surgery

Oral presentation

### Surgical treatment of distal cerebral aneurysms: a 20-year experience

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**Objectives:** Retrospective analysis of surgical treatment distal cerebral aneurysms (DCA).

**Background:** Authors report their experience in surgical treatment of 198 patients with distal cerebral aneurysms.

**Methods:** 198 patients with distal aneurysms were operated between January 2000 and December 2019 (153 – microsurgery, 45 – endovascular treatment). Among all patients with cerebral aneurysms that were treated at the same time DCA were identified in 4,5% cases. The database was reviewed retrospective to identify distally located cerebral aneurysms and review nuances of their surgical treatment. DCA that were associated with arteriovenous malformations, moyamoya disease and atrial myxoma were excluded.

**Results:** Among microsurgery group 54,2% localized on the ACA, 24,2% - on the MCA, 10,4% - on the PCA, 9,2% - on the PICA, 2% - on the other cerebral artery. Saccular shape of aneurysm was in 84,3%, fusiform in 15,7% of cases. One-hundred twenty five (81,7%) had previously bled, 18,3% were unruptured. Direct clipping was used in 74,5%, trapping without revascularization - 17,6%, trapping or excision with revascularization - 5,9%, wrap reconstruction in 2% of patients. Overall surgical outcome was as follows: 65,8% had good results (mRs 0-2), 9,2% - moderate disability (mRs - 3), 13,7% - died.

In endovascular group there were 45 patients (only 15,6% patients have been ruptured). Among endovascular treated aneurysms 42,2% were on the PCA, 33,3% - on the ACA, 6,7% - MCA, 17,8% - on the cerebellar arteries. Saccular aneurysms were in 71,1%, fusiform in 28,9% of cases. Coiling was done in 15 (33,3%) patients, whereas parent artery occlusion was done in 6 (13,3%) cases. Coiling with stent assistance was used in 17(37,8%), flow-diverters – in 13(28,9%). Overall, 97,8% had good results (mRs 0-2), one patient died.

**Conclusions:** Distal cerebral aneurysms are rare entity that require unique and personal surgical strategy. Although technically demanding, good treatment results can be received with multidisciplinary management.

## Oncology

Oral presentation

### Photodynamic therapy for malignant brain tumors

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**Objectives:** to analyze the possibility of using photodynamic therapy in the treatment of malignant brain tumors

**Background:** Photodynamic therapy (PDT) is a two-step treatment involving the administration of a photosensitive agent followed by its activation at a specific light wavelength for targeting of tumor

**Methods:** prospective analysis of 35 patients with high-grade gliomas (18 women and 17 men), who had undergone surgery in University Clinic of Moscow State University of Medicine and Dentistry between 01.09.2019 and 01.03.2023.

**Results:** The average age at surgery was 52,71 years. 35 patients underwent 38 surgical procedures (30 resections and 2 stereotaxic procedures, one – combination resective and stereotaxic procedures, 2 patients have been reoperated (one- 2 times, one – 3 times). 5-ALA was per oral administered 4-4.5 h before FD in 14 surgeries, in 3 – sublingual, 21 surgeries - with combination of chlorine E6 and 5-ALA. According to histology data, 26 patients had glioblastoma (grade 4) , 5 patient – oligodendroglioma (grade 3), 3 – astrocytoma (grade 2) and 4 - metastases. Resection was carried out until the residual part of the tumor occupied functionally significant regions of the brain, or no visible fluorescence was observed. After fluorescence-guided resection, the localization and the size of residual parts of the tumor with increased fluorescence intensity of PSs were detected. PDT was performed at each zone with an energy dose of 30 J/cm<sup>2</sup>. After the PDT session, the change in the intensity of residual fluorescence was recorded. Total resection of tumor tissue was performed according to MRI and CT images, and additional tissue with increased fluorescence intensity was removed.

**Conclusions:** PDT remains a promising therapeutic approach that requires further study in HGGs to analyze median survival rate. Photodynamic techniques such as photodynamic diagnosis (PDD), fluorescence-guided tumor resection (FGR) and photodynamic therapy (PDT) are currently undergoing intensive clinical investigations as adjuvant treatment for malignant brain tumors



## Skull Base

ePoster presentation

### A rare case of unilateral isolated intraocular supraorbital schwannoma

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**Objectives:** A rare case of unilateral intraocular schwannoma arising from the supraorbital nerve is presented. An excision biopsy with complete removal of the mass in the superior orbit was performed. Due to which proptosis was also improved.

**Background:** Orbital tumors have always been an enigma and offer a diagnostic challenge to the neurosurgeon. Schwannomas of the orbit are rare and account for only 1-6% of all orbital tumors.<sup>1</sup> In the orbit, schwannomas are usually unilateral and may arise from the supraorbital, infraorbital, supratrochlear. The variable presentation and location of this tumor can certainly make the diagnosis difficult and is confirmed by histopathological examination.

**Methods:** A 55-year-old female presented with a painless, slowly growing mass in the right superior. She did not had any other symptoms. On examination, visual acuity was normal. The right side demonstrated a mass in the superior orbit because of which she developed Proptosis of right eye. The mass measured approximately 20 mm × 15 mm and the size. The pupillary reactions, color vision and visual fields were normal. Supraorbital, infraorbital and corneal sensations were intact. Bicoronal incision with right frontal supraorbital craniotomy was performed with removal of supra-orbital nerve mass. Peroperative findings were of a smooth, well-encapsulated mass. The mass was attached to the supra-orbital nerve. The mass was removed en bloc with intact capsule. Postoperatively, patient had an uneventful recovery and proptosis also subsided.

**Results:** Patient's proptosis was improved within a day. Postoperative ct brain also confirmed total removal of mass and resolution of proptosis.

**Conclusions:** Orbital schwannoma arising from the supraorbital nerve is rare. Our patient presented with the tumor in this uncommon location. A solitary schwannoma, though rare, should be considered as a preoperative differential diagnosis of a unilateral slow-growing orbital mass in an adult and prompt management is warranted to prevent development of vision-threatening complications.

## Skull Base

Oral presentation

### Intraoperative real-time near-infrared image-guided endoscopic endonasal surgery for pituitary tumors

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**Objectives:** To assess whether the delayed-window indocyanine green (ICG) (DWIG) technique can visualize and distinguish normal pituitary gland from tumors under the endoscope in real-time during surgery.

**Background:** In endoscopic endonasal surgery of pituitary tumors, tissue identification and intraoperative judgment depend largely on the surgeons' surgical experience.

**Methods:** Twenty-five patients with pituitary adenoma received 12.5 mg intravenous ICG during surgery. Near-infrared (NIR) visualization was performed from 0 to 180 minutes following ICG administration. Only eight patients underwent dynamic contrast enhanced (DCE) perfusion magnetic resonance imaging (MRI) due to insurance system limitations. Therefore, we analyzed these eight patients in detail.

**Results:** The normal pituitary gland and pituitary adenoma were visualized by NIR fluorescence in all 25 patients. The relative ratio of the fluorescence emission of the normal gland to that of the tumor (signal-to-background ratio [SBR] normal gland/tumor) increased after 15 minutes, peaking at 5.8 at 90 minutes. It suggested the pituitary gland was more clearly visualized during that period. The tumor/blood (SBR tumor) and normal gland/ blood (SBR gland) NIR fluorescence was significantly positively correlated with each  $K^{trans}$  on dynamic contrast-enhanced MRI, indicating vascular permeability.

**Conclusions:** This study showed the utility of DWIG for identifying a normal pituitary gland from a tumor in endoscopic endonasal surgery from 15 to 90 minutes following ICG administration. Permeability can contribute to gadolinium enhancement on MRI as well as ICG retention and NIR fluorescence in a normal pituitary gland and tumor.

## Functional

Oral presentation

Prospective data collection of patients using remote programming NeuroSphere™ Virtual Clinic and retrospective data collection of previously outpatient programmed patients

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**Objectives:** To show advantages of remote programming.

**Background:** (SCS and DRG are standard of care for patients with chronic neuropathic pain. . Furthermore, the disparity between travel times and transportation options illuminate a potential association to the individuals' decision on seeking healthcare. Telehealth in general refers to the exchange of medical information through electronic communication. However, it is usually restricted to video conferences, without interfering with implanted medical devices. NeuroSphere™ Virtual Clinic is a platform for remote programming of those devices. It is accessible via tablets/smartphones and allows direct contact between a patient and their doctor/pain nurse.

**Methods:** We initiated a pilot study for evaluating safety and performance of remote care in patients with SCS or DRG stimulation. Prospective data has been collected under the new standard of care i. We assess ten scores and categories to evaluate the preoperative status, the status at implantation of the system, and the postoperative course. The postoperative data are assessed in the context of video conferences for remote programming or any personal outpatient appointments. 12 months after implantation a final video conference is scheduled.

**Results:** The study contained n=10 pats. in the retrospective group. The mean duration of their programming appointment including waiting time was 43 minutes and their mean travel time 71 minutes (mean travel distance 106km). Another 10 patients have been enrolled for remote programming. Their overall satisfaction with the telehealth system is high.

**Conclusions:** Compared to the retrospective group they do not show a lack of efficacy of their stimulation or pain relief. The general convenience with the system is high which is conform to previous published data regarding telehealth in general. Witek et al. reported no statistical difference between virtual and in-person assessments and Powers et al showed that wearables can be used for an objective quantification of symptoms without the need for clinic facility time.

## Spine

ePoster presentation

### Outcome predictors in the surgical management of intradural spinal tumors

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**Objectives:** To evaluate the different factors affecting the surgical outcome of intradural spinal tumors.

**Background:** Among the intradural spinal tumors, meningiomas, ependymomas, astrocytomas, and nerve sheath tumors are the most common. Early surgical intervention with the use of technical adjunctives and postoperative adjuvant therapy has improved the outcome.

**Methods:** prospective study was done on 30 consecutive patients with an age group ranging from 20 to 60 years. All patients underwent surgery for intradural spinal tumors at Menoufia University and Alexandria Armed Forces Hospital. Data were collected regarding histopathological diagnosis, clinical presentation, tumor location, operative data, and postoperative complications. A functional outcome was assessed using the modified McCormick Scale (MMS).

**Results:** There were 16 (53.3%) patients with extramedullary tumors and 14 (46.7%) patients with intramedullary tumors. Guided tissue regeneration (GTR) was achieved in 21 (70%) patients, mostly meningioma and ependymoma. Extramedullary locations are more likely to achieve GTR and are associated with better outcomes than those with intramedullary locations. The mean preoperative MMS ( $2.70 \pm 0.88$ ) showed marked improvement compared with the mean  $2.20 \pm 1.42$ ,  $2.0 \pm 1.51$ , and  $1.93 \pm 1.51$  immediately postoperatively, 6-month, and 1-year follow-up, respectively. The complication rate was 33.3% (10 patients), and cerebrospinal fluid leak was the most common complication.

**Conclusions:** The use of adjunctive (cavitron ultrasonic aspirator, IOM), the extramedullary location, low preoperative MMS, GTR, and low tumor grade were associated with better postoperative outcomes.

## Paediatric

Oral presentation

ShuntScope guidance in pediatric hydrocephalus: indications, surgical technique, and results

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**Objectives:** Optimal ventricular catheter implantation in pediatric hydrocephalus can become a highly challenging task due to abnormal anatomical configuration or the need for transaqueductal stent placement. Transluminal endoscopy with the ShuntScope has been invented to increase the rate of successful catheter placements.

**Background:** This presentation aims to evaluate ShuntScope- guided technique, achieved intraoperative image quality, and related surgical and radiological outcomes in the pediatric population.

**Methods:** A retrospective analysis of all paediatric patients undergoing ventricular catheter placement using the Shuntscope from 01/2012 – 01/2022 in the author's department was performed. Demographic, clinical, and radiological data were evaluated. The visualization quality of the intraoperative endoscopy was stratified into the categories; excellent, medium, and poor and compared to the postoperative catheter tip placement. Follow-up evaluation included the surgical revision rate due to proximal catheter occlusion.

**Results:** A total of 65 Shuntscope-assisted surgeries have been performed on 51 children. The mean age was 5.1 years. The most common underlying pathology was a tumor- or cyst-related hydrocephalus in 51%. Achieved image quality was excellent in 41.5%, medium in 43%, and poor in 15.5%. Ideal catheter placement was achieved in 77%. There were no intraoperative complications associated with the Shuntscope. The revision rate due to proximal occlusion was 4.61% during a mean follow-up period of 39.7 months. No statistical correlation between image grade and accuracy of catheter position was observed (p-value was 0.290).

**Conclusions:** The Shuntscope can be considered a valuable addition to standard surgical tools in treating selected cases of pediatric hydrocephalus. Even suboptimal visualization contributes to high rates of correct catheter placement and, thereby, to a favorable clinical outcome.

## Oncology

ePoster presentation

Outcome of endoscopic endonasal approach in management of pituitary adenomas, single center early experience

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**Objectives:** To evaluate the surgical procedure through the endonasal approach, outcomes and the complications of patients with pituitary adenomas.

**Background:** The tumors of the pituitary gland are markedly different from other brain tumors, they metastasize rarely. The extent of tumor invasion to the surroundings is an important factor in the prediction of the probability of complete removal and recurrence.

**Methods:** A case series of patients presented to the Menoufia university hospital at the clinic or the emergency neurosurgery service during the period of 2017, 2018 with six months of follow-up. Postoperative visual assessment, and postoperative MRI Sella with contrast with fat suppression was done for all patients.

**Results:** The total number of this series was 20, The average time of the operation was 2.5-3 hours, there was a need for middle turbinectomy in seven cases who had hypertrophied turbinate. Diabetes insipidus were encountered in five patients who improved within 2 months.

**Conclusions:** The endoscope provides significant merits during the surgical approach and the resection of the tumor. It gives panoramic views dissimilar to the microscope and allows dynamic, magnified inspection of the surgical field.

## Spine

ePoster presentation

### Evaluating the outcome of classic laminectomy surgery alone versus laminectomy with fixation surgery in patients with lumbar canal stenosis

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**Objectives:** This retrospective study targets to evaluate the outcome of classic laminectomy surgery alone versus laminectomy with fixation surgery in patients with lumbar canal stenosis regarding improvement of pain and function.

**Background:** Management of lumbar canal stenosis should be started with conservative treatment and preferably with a multimodal approach, but in cases of severe pain with extensive neurogenic claudication symptoms, surgical intervention is indicated.

**Methods:** Data of 184 patients of the study groups were divided into group A (data from patients who underwent laminectomy and foraminotomy only) and group B (data from patients who underwent laminectomy and foraminotomy with spinal fixation). Preoperative, operative, postoperative (PO), and follow-up data were extracted and analyzed from files of patients fulfilling the inclusion criteria.

**Results:** Primary outcome was at least 50% improvement of pain severity regarding numeric rating scale (NRS) and Oswestry disability index (ODI) score at 6-months PO compared to preoperative scores. Operative time was significantly longer in group B than group A. Immediate PO data regarding PO analgesic requirement, amount of wound drainage, and PO hospital stay showed non-significant difference between both groups. There was a statically significant improvement of EHL muscle strength regarding Odom's scoring in group B in which the success rate for pain improvement was 81.8% and for disability was 66.8%. There were insignificant differences in patient's satisfaction to surgery with variable ages, a significant outcome in females and in patients with fewer levels of affection of both groups.

**Conclusions:** The present study reported the efficacy and safety of the laminectomy, foraminotomy, discectomy, and medial facetectomy with spinal fixation using trans-pedicular screws for management of patients with spinal canal stenosis.

## Spine

Oral presentation

Role of MRI and 18-FDG PET CT in identifying pain generators in patients with low back pain

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**Objectives:** 1) To study FDG-18 PET CT in patients presenting with low back pain with or without radiculopathy and to establish it as an adjuvant modality with MRI,

2) To validate the role of a non-invasive imaging modality to replace the invasive pain injections, discograms and other procedures to identify pain generator.

**Background:** Low back pain (LBP) is a major cause of pain and disability and Oftentimes typical imaging (dynamic radiography, MRI, and CT) fail to identify its exact location. Nuclear medicine investigations like SPEC-CT or 18 FDG PET CT can help to identify the pain generators where conventional imaging modalities failed. Thus, in this study we have studied the role of 18-FDG PET CT as an adjunct tool to MRI in identifying the pain generators in patients of low back pain where conventional MRI was inconclusive or unable to do so.

**Methods:** 20 patients were included in the study. All the patients with no specific pain generator on MRI LS spine with SI joint underwent 18-FDG PET CT. Patients in whom active pain generators were identified on PET CT were treated for that level. Rest of the patients were managed according to level based of MRI and clinical co-relation. Outcomes were measured on basis of VAS and ODI scores after 1 month.

**Results:** 10%(2/20) patients had active pain generator identified on PET CT and both were in pars interarticularis. The improvement in mean VAS and ODI score in patients intervened on basis of PET CT was 70.59% and 50% respectively whereas in patients treated on basis of MRI which was VAS and ODI score improved by 58.57 and 30.81% respectively.

**Conclusions:** 18-FDG PET CT can be a useful and non-invasive modality adjunct to MRI in patients in chronic low back pain where conventional modalities are unable to identify the pain generators and thus beneficial in better outcomes



## Spine

Oral presentation

Indirect decompression in degenerative lumbar spine pathology: advantages and disadvantages

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**Objectives:** The study aims to demonstrate that indirect surgical decompression is a possible indication of lumbar spine degenerative pathology.

**Background:** Indirect surgical decompression was performed in 580 patients diagnosed with a lumbar degenerative disease. Thirty preoperative assessments were performed using the VAS pain visual analog scale and the Oswestry disability index. In the same way, they were used after the surgical procedure with a minimum follow-up of 2 years.

**Methods:** Consent was obtained from each study participant, and the clinical history was completed emphasizing the VAS and Oswestry pain assessment scale to measure disability before and after surgery for at least two years.

**Results:** Foraminotomy was the most performed procedure (40.1%), followed by hemilaminectomy (14.9%). The distribution by levels worked predominated in one level (66.2%), two levels (30.1%), and three levels (3.7%), with levels L4-L5 (59.4%) being the most frequently affected. Regarding VAS pain, a significant improvement was demonstrated in the immediate postoperative period (32.6%), as was the Oswestry Disability Index (36.5%).

**Conclusions:** Indirect surgical decompression is a recommended surgical indication used as a surgical alternative in treating lumbar degenerative pathology.

## Education, Ethics, Socioeconomic

Oral presentation

Indigenous ICP monitoring system, syringe neuro-port & craniomaper: our experience in resource constraint settings

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**Objectives:** To evaluate the feasibility & utility of:

- Indigenous subdural ICP monitor in TBI patients.
- Custom made neuro-port for deep seated brain lesion surgery.
- Craniomaper for surface localization of cerebral mass lesion.

**Background:** Monitoring of ICP plays an important role in managing TBI patients. Fatality may not result from the primary insult, rather progressive brain damage may develop over time due to raised ICP.

Challenging deep-seated brain lesions have been elusive because of the risk of damaging the surrounding dense & delicate neural structures. Neuro port is a minimally invasive surgical technique performed through a specially designed tube from a syringe.

Accurate craniotomy placement is essential in neurosurgery. Localization of mass lesion can be improved using intraoperative ultrasound, stereotactic system & neuron navigation; but these tools are not always available.

**Methods:** These projects were carried out as prospective study at Apollo Hospital Guwahati, India over a period of 2 years.

**Results:** Our indigenous ICP monitoring system provides adequate diagnostic information. 12 out of 19 had raised ICP with a mean of 30 cm H<sub>2</sub>O. Patients of head injury with delayed rise in ICP had the worst outcome.

With neuro port use the average operative time was around 60 to 120 min., total excision / drainage of the pathology was achieved in all cases. Primary Goal of surgery accomplished in all cases.

With craniomaper, mean time of scan was 10+/- 2 min; the scalp landmarks were followed in every case while performing the craniotomy / burr hole. Intra operative localization was successful in all the cases.

**Conclusions:** Indigenous ICP monitoring system is feasible, easy to use, cheap & provides adequate information. Syringe neuro-port technique decreases operative morbidity & time; enhancing safety and completeness of surgery. Craniomaper is an alternate cheap option where image guidance / stereotactic systems not available.

## Spine

Oral presentation

Identifying new entry point for free hand cervical pedicle screw insertions - a cadaveric study

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**Objectives:** Confirm the efficacy of lateral vertebral notch as an entry point for pedicle screw by free hand technique.

**Background:** Pedicle screws have been the gold standard for posterior stabilization procedures of the thoracic and lumbar spine region but it is not widely accepted in the cervical region mainly because of the morphological characteristics of cervical pedicles, their close relations to vital structures and technical demanding. A single center cadaveric study was conducted to look at the efficacy of lateral vertebral notch as an entry point for pedicle screw by free hand technique.

**Methods:** Part 1: Initially, cervical pedicle screws were inserted in 25 human cadavers to understand the intricate relationship between the pedicle and spinal cord, nerves, vertebral artery, and foramen transversarium. The entry point was based on relation to the lateral vertebral notch. The angulation was roughly between 40 -45° and parallel to and just inferior to the superior endplate of the vertebra. Subsequently, A total of 152 screws were inserted in 20 patients. Part 2: A total of 20 patients were operated on, and indications varied from trauma, degenerative disease with osteoporosis tumor, and deformity. Total Number of pedicle screws =152

**Results:** Of the 152 pedicle screws, 109 screws were inside the pedicle (Grade 0), 26 screws were Grade 1, 12 screws were Grade 2 (7.8%), and 5 screws were Grade 3 (3.28%). The most common complication has been screw malposition in 11% of cases (Grades 2 & 3). There was one death due to multiple organ failure in the postoperative period (18 days) no spinal cord nerve root or vertebral artery injury.

**Conclusions:** Freehand technique with an entry point based on lateral vertebral notch is a simple technique, a steep learning curve working with cadavers in the present study. The lateral vertebral notch and its relationship to the pedicle are constant usually unaffected.

## Neurovascular Surgery

Oral presentation

Clinical characteristics of intracranial aneurysms in elderly patents over 70 years old: a retrospective observational study

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**Objectives:** The study aimed to evaluate the characteristics of intracranial aneurysms (IAs) in elderly age group.

**Background:** Although the characteristics of intracranial aneurysms (IAs) in different age groups have been well documented, they remain relatively unclear in elderly patients due to a lack of large sample studies.

**Methods:** Data from IA patients aged more than 70 years who were treated in our centre from January 2016 to January 2020 were retrospectively collected.

**Results:** A total of 290 elderly patients (75.9% female) with a mean age of  $74.0 \pm 4.7$  years were analysed. Rupture occurred in 60.7% of patients, 38.6% of whom presented with meningeal irritation, and seizures were noted in 2.3%. A total of 48.9% of the patients with ruptured IAs had initial symptoms presenting with slow development, and the mean delay from ictus was prolonged to  $264.2 \pm 914.0$  hours. In addition, 61.9% of the patients with ruptured IAs had lesions with a maximum diameter of less than 5 mm. A total of 30.3% of the patients had multiple aneurysms, 35.5% had aneurysms with irregular shapes and 54.8% had cerebrovascular atherosclerotic stenosis (CAS). Pulmonary infection ( $n = 138, 47.6\%$ ), hydrocephalus ( $n = 72, 24.8\%$ ), and thrombosis ( $n = 35, 12.1\%$ ) were common complications during hospitalization. By the end of the 1-year follow-up, 22.1% of the patients had unfavourable clinical outcomes, and the mortality rate was 23.4%.

**Conclusions:** Several characteristics regarding IAs in elderly patients were reported, including an obvious female predominance; mild, slow initial symptom development causing prolonged admission delay; a low incidence of meningeal irritation and seizures due to decreased electrophysiological activity of the neurons; increased percentages of CAS, multiple aneurysms, and aneurysms with daughter sacs causing a high risk of rupture even for small lesions; a high risk of complications during hospitalization; and relatively poor clinical outcomes.

## Neurovascular Surgery

ePoster presentation

### Factors affecting the outcome after surgical clipping of ruptured distal anterior cerebral artery (DACA) aneurysms

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**Objectives:** The purpose of this study is to determine the relation of outcome (GOS) using various independent variables, Hunt and Hess grade, Miller Fischer grade, IOR and comparison of outcomes at the time of discharge and last follow ups with respect to various factors.

**Background:** DACA aneurysms are rare as compared to other anterior circulation aneurysms. The incidence is about 1-9% of all intracranial aneurysms. These aneurysms are unique in terms of their incidence, clinical presentation, location, morphology and treatment outcome.

**Methods:** Demographic data, aneurysm characteristics, and treatment outcomes were evaluated in 28 ruptured DACA aneurysms and operated over a period of 13 years. Association between Independent variables and dependent variable at discharge and at last followed up (13 years) were analyzed and tried to discover whether there was any interrelationship between these factors and outcome.

**Results:** Over a period of 13 years 500 patients harboring ruptured intracranial aneurysms were surgically clipped and out of them 5.6% had ruptured DACA aneurysms. In this DACA aneurysms series, 20 (71.4%) patients had low grade and 8 (28.6%) had high grade of H&H. Out of 28 patients 67.8% had good recovery, 21.5 % were severely disabled and 10.7 % died at the time of discharge. On last follow up (13 years) 85.7 % patients had favorable outcome and 14.3 % patients had unfavorable outcome. Alcohol consumption (*p value* - 0.04) and use of temporary clip (*p value*-0.00) had unfavorable outcome which were statistically significant. On last follow up (13 years) smoking (*p value* - 0.03) and use of temporary clip (*p value* - 0.00) were significant predictors for unfavorable outcome.

**Conclusions:** Alcohol consumption and use of temporary clip were the predictors for unfavorable outcome at the time of discharge. On last follow up smoking, and use of temporary clip were the risk factors for unfavorable outcome.

## Paediatric

Oral presentation

### Neuroendoscopic principles and practice for the treatment of middle fossa arachnoid cysts: a systematic review and meta-analysis of 165 cases

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**Objectives:** We described arachnoid cysts' clinical, radiological and treatment (endoscope type and fenestration modalities, stoma location, number and rationale) characteristics and outcomes.

**Background:** Primarily, arachnoid cysts are manifestations of dysembryogenetic splitting or duplication of embryonic meningeal mesenchyme. They are rarely symptomatic; with symptom onset and severity being dependent on location, size and presence of cyst complications. Treatment strategies now favour less-invasiveness, hence neuroendoscopic treatment.

**Methods:** A systematic review of PubMed and Cochrane CENTRAL was done on 1<sup>st</sup> February 2023, using a prospectively registered protocol (PROSPERO CRD42023394345). Search words (from the keywords; 'endoscopic treatment' and 'middle fossa arachnoid cysts') were combined using boolean operators in the search strategy. Sixty-one articles were retrieved from PubMed and none from CENTRAL. There were fifteen irrelevant articles after records screening. Full text review was on 46 articles; with four new articles after review of bibliographies. Eighteen studies (four case reports and fourteen case series) were recruited for the quantitative (using individual participant and aggregate data for 165 participants) syntheses. Joanna Briggs Institute critical appraisal tools were used for methodological quality and bias assessment.

**Results:** The methodological quality was mostly (15/83.33%) good. Middle childhood (16.57%) was modal; with more males (62.72%). Headaches (53/29.28%), seizures (30/16.58%) and macrocephaly (25/13.81%) were common presentations. Galassi II (55/48.25%) and III (53/46.49%) types were predominant. Cyst wall fenestrations were mostly using bipolar diathermy (31/43.66%) & biopsy forces (18/25.35%), at these locations: CNIII&ICA (32/25.81%), CNII&ICA (27/21.77%) and CNIII&tentorium (23/18.55%); using >2 (78/68.42%), two (14/12.28%) or one (22/19.30%) fenestration. Stoma expansions were mostly with balloon catheter alone (80/73.39%). There was significant clinical (87.50%) improvement, with radiological disappearance (5.33%) and decrease (65.33%) in cyst volume; with 34.47±26.90% average reduction.

**Conclusions:** Good-quality, but low-level evidence showed MCFAC presenting with headaches, seizures and macrocephaly, in childhood. At least two fenestrations using bipolar-diathermy/ forceps and balloon-catheter expansion were done.

## Oncology

ePoster presentation

### Understanding the brain-heart connection through a case of wounded glioma syndrome

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**Objectives:** To present a case of wounded glioma syndrome in a patient post-tumor biopsy.

**Background:** Wounded glioma syndrome is a complication observed after incomplete tumor resection resulting to edema or hemorrhage within the tumoral bed. We discuss a patient with an anterior corpus callosum tumor who underwent open biopsy eventually succumbing to cerebrogenic fatal arrhythmia.

**Methods:** A 37-year-old female without co-morbidities presented with 13-month history of headache. MRI revealed an anterior corpus callosum infiltrating lesion suspicious for a glioma. Neurologic examination only showed low cognitive assessment score (MOCA 20/30). ECG was normal sinus rhythm. Steroids and Levetiracetam were started prior to operation. Patient underwent right frontal craniotomy and biopsy of tumor with unremarkable events.

**Results:** Frozen section revealed a neoplasm with epitheloid and spindle cell features. During the first hospital day, patient had episodes of bradycardia followed by decrease in sensorium. Plain cranial CT scan showed progression of edema without hemorrhage within the tumor bed. This was followed minutes later by two episodes of generalized tonic-clonic seizures and pulseless ventricular tachycardia. Cardiac resuscitation was done for 24 minutes but patient eventually expired.

**Conclusions:** Location of the lesion and the epileptogenicity of the peritumoral cortex greatly contributed to the patient's demise. Involvement of the fronto-mesial structures, particularly the insula and the cingulate cortex, and their connection to the central autonomic network, increased susceptibility to arrhythmias. Upregulation of glutamate and downregulation of its clearance in the peritumoral cortex decreased seizure threshold which worsened post-operative edema, further aggravating the dysregulation of the brain-heart-connection.

## Hydrocephalus

Oral presentation

Application of the shuntscope in selected cases of adult hydrocephalus: experience of 63 procedures

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**Objectives:** Ventricular catheter placement in the selected subset of adult hydrocephalus can be highly challenging due to abnormal anatomical configuration or the need for transaqueductal stent placement.

**Background:** This presentation evaluates Shuntscope system, achieved intraoperative image quality, related radiological and surgical outcomes in adults.

**Methods:** A retrospective analysis of all adult patients undergoing ventricular catheter placement using the Shuntscope from 11/2011 to 07/2022 in the author's department was performed. Demographic, clinical, and radiological data were evaluated. The visualization quality of the intraoperative endoscopy was stratified into the categories; of excellent, medium, and poor, compared to the postoperative catheter tip placement. Follow-up evaluation included the surgical revision rate due to proximal catheter misplacement.

**Results:** A total of 63 Shuntscope-assisted surgeries have been performed on 60 adults. The mean age was 48.43 years. The most common underlying pathology was a tumor- or cyst-related CSF impairment in 38.33 %, followed by pseudotumor cerebri in 21.66%. Achieved image quality was excellent in 39.68%, medium in 47.62%, and poor in 12.7%. Ideal catheter placement was achieved in 79.37%. There were no intraoperative complications associated with the Shuntscope. The revision rate due to suboptimal proximal VC placement was 4.76% during a mean follow-up period of 27.75 months. A statistical correlation between image quality grade and accuracy of catheter position was observed (p-value < 0,001).

**Conclusions:** The Shuntscope can be considered a valuable addition to standard surgical tools in treating a selected subset of adult hydrocephalus. Even suboptimal visualization contributes to high rates of correct catheter placement.



## Hydrocephalus

Oral presentation

Endoscopic transaqueductal stenting: indications, surgical technique, and results

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**Objectives:** Successful treatment of aqueduct stenosis-related non-communicating hydrocephalus due to its peculiar characteristics, and multifold etiology can be highly challenging.

**Background:** Here the authors present the feasibility, effectiveness, and limitations of the endoscopic technique used and the achieved clinical and radiological results.

**Methods:** The clinical and radiological database for endoscopic transaqueductal stenting (TAS) procedures from 03/1993 to 10/2022 was retrospectively analyzed and prospectively followed. Shuntscope, Gaab scope, and flexible endoscope were used solely or in combined technique. Particular attention was given to indications, choice of endoscopic technique, complications, and results. Follow-up evaluation included the surgical revision rate due to aqueductal catheter misplacement or dysfunction.

**Results:** A total of 28 TAS procedures were performed on 23 patients (14 adults and 9 children, nine female patients, and fourteen male patients; mean age, 28.304 years, age range 4 months to 61 years). The most common underlying pathology was an isolated fourth ventricle after shunting in 56.52%. Shuntscope-guided TAS in a single technique was performed in 11 procedures and in the combined technique with Gaab or flexible endoscope, in other 8 procedures, followed by Gaab endoscope-assisted stenting, solely (5 procedures), or combined with a flexible endoscope (3 procedures). In one case TAS was placed under a flexible endoscope, exclusively. A successful TAS was achieved in 26 of 28 procedures (92.86%). In two procedures, because of unmanageable, distorted anatomical circumstances, the TAS had to be abandoned. Two late revisions (7.14%) were necessary. Postoperatively, 19 patients (82.6%) improved. The mean follow-up period was 44,65 months (1-136 months).

**Conclusions:** Shuntscope-guided TAS represents a reliable and low complication-rate treatment option for the selected subset of aqueductal stenosis. The combined endoscopic technique helped to overcome the shortcomings of visualization of each endoscope used solely and maximized diagnostic efficacy. A high rate of optimal transaqueductal stent placement and its long-term functionality is achievable.

## Oncology

Oral presentation

Long-term survival from breast cancer brain metastases in the era of modern systemic therapies

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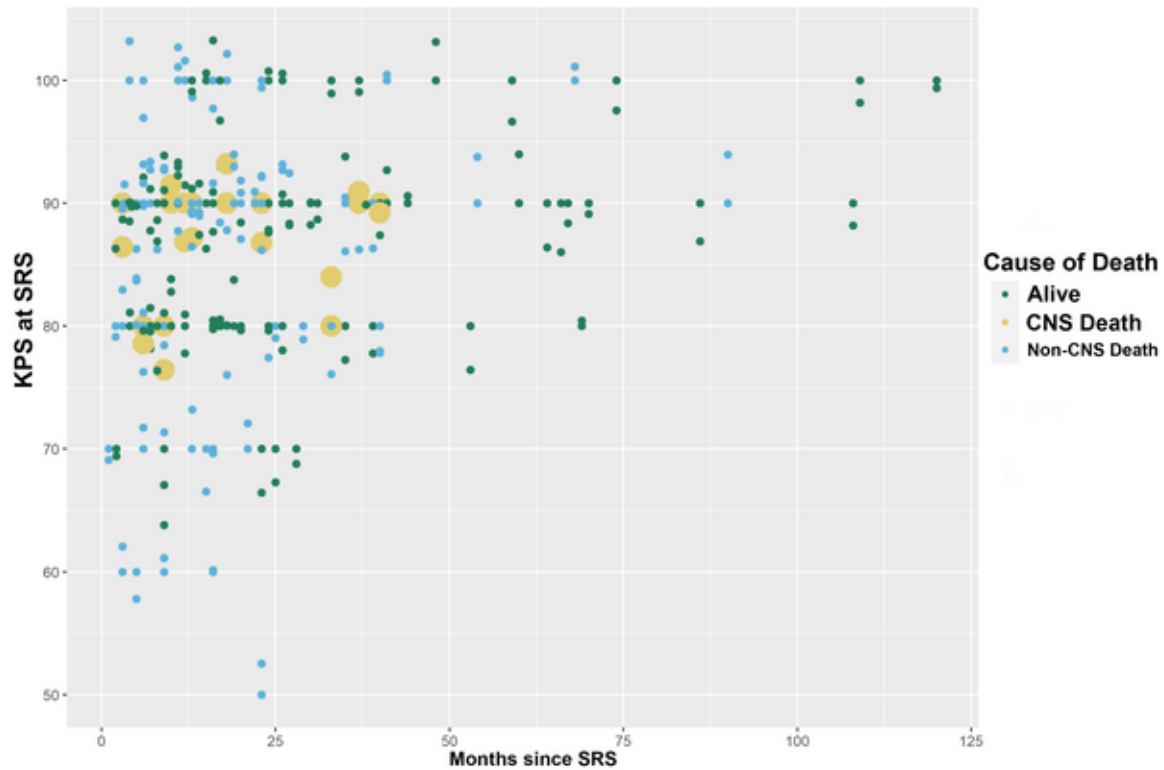
**Objectives:** To characterize BCBM patients that achieved long-term survival and identify factors associated with those uniquely better outcomes as well as to find predictors of mortality for BCBM patients.

**Background:** Median survival for all breast cancer patients with brain metastases (BCBM) has increased in the era of targeted therapy (TT) and with improved local control of intracranial tumors using stereotactic radiosurgery (SRS) and surgical resection. However, detailed characterization of the patients with exceptionally long-term survival remains sparse.

**Methods:** We reviewed 190 breast cancer patients with 931 brain tumors receiving a total of 429 stereotactic radiosurgeries (SRS) who were followed at our institution with prospective data collection between 2012 and 2022. We analyzed clinical, molecular, and imaging data to assess the relationship between outcomes and tumor control.

**Results:** Median overall survival (OS) from SRS and from breast cancer diagnosis was 25 months (95% CI 19-31 months) and 130 months (95% CI 100-160 months), respectively. 17% of patients achieved long-term survival (survival  $\geq 5$  years from SRS). Predictors of long-term survival included HER2+ status ( $p=0.041$ ) and treatment with targeted therapy (TT) ( $p=0.046$ ). A limited number of patients (11%) died from CNS causes. A predictor of CNS-related death was the development of leptomeningeal disease after SRS ( $p=0.025$ ), while predictors of non-CNS death included extracranial metastases at first SRS ( $p=0.017$ ), triple-negative breast cancer ( $p=0.002$ ), KPS  $<80$  at first SRS ( $p=0.002$ ), and active systemic disease at last follow up ( $p=0.001$ ). Amongst the long-term survivors, none died from CNS

progression.



**Conclusions:** In the modern era, BCM patients can achieve longer survival than might be anticipated. The use of TT and HER2+ disease are associated with long-term survival. Importantly, the primary cause of death was extracranial disease progression and none of the patients living  $\geq 5$  years died from CNS-related disease.

## Oncology

Oral presentation

### Survival analysis of patients with urothelial cancer brain metastases based on treatment modality

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**Objectives:** The aim of this study is to explore OS, as well as survival based on treatment modality (surgical resection, stereotactic radiosurgery, and chemotherapy) from a large sample size of patients with UCa BM.

**Background:** Despite the prevalent evidence on the survival of patients with more common brain metastases (BM), information on the survival of urothelial cancer (UCa) patients with BM is largely unreliable given the scarcity of cases.

**Methods:** In this retrospective study, we used the TriNetX Research Network, a real-world and in-house database with longitudinal electronic medical records from 92 institutions. The database was queried for patients with UCa who also have BM using the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10), and Current Procedural Terminology codes (CPT). Analysis was performed using several treatment modalities including stereotactic radiosurgery (SRS) alone, SRS with surgical resection, and chemotherapy.

**Results:** We identified 357 patients with UCa BM, representing 4.7% of the 7,521 patients diagnosed with primary UCa. The mean age at diagnosis was 65.6 years, with patients being predominantly male (67%). The median overall survival (OS) from BM diagnosis was 18.6 months. For patients treated solely with stereotactic radiosurgery (SRS), the median OS was 20.8 months. Likewise, for patients treated with SRS and surgical resection, the median OS was 18.6 months. There was no significant difference in survival between patients treated with SRS alone and SRS with surgical resection ( $p=0.875$ ). For patients treated only with gemcitabine chemotherapy, the median OS was 15.4 months.

**Conclusions:** This study represents the largest known retrospective study of UCa BM patients. Surgical resection and SRS are important and effective management strategies for patients with BM from UCa. There are comparable OS periods for patients that have undergone SRS alone and those with SRS with craniotomy. Treatment of BM with systemic chemotherapy without any neurosurgical intervention demonstrated the shortest OS.

## Skull Base

ePoster presentation

### Extent of the frontal sinuses in the aspect of neurosurgical craniotomy approaches

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**Objectives:** The aim of the study was the morphometric analysis of the frontal sinuses based on CT imaging. Such measurements have a significant clinical aspect in order to minimize the risk of unintended sinus opening during frontal craniotomy.

**Background:** Frontal sinuses within the frontal bone can be a potential obstacle in neurosurgical approach in this region. Their unintended opening during craniotomy is not beneficial due to the risk of brain infections by bacteria inhabiting the sinus mucosa. Therefore, such opening should be avoided whenever the surgical procedure does not involve the sinus itself.

**Methods:** In an attempt to minimize measurement and observer bias, all measurements were completed by one experienced researcher specializing in image interpretation. Each measurement was reiterated three times under the same conditions but at different times, and then averaged.

The measurements included as shown in Figure.

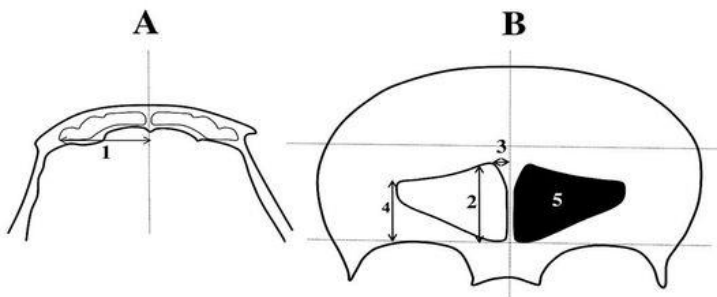


Figure. Diagram of measurements, A: Transverse projection; 1 – Transverse diameter of the sinus, B: Frontal view; 2 – Vertical diameter of the sinus; 3 – Distance between the highest point and the midline; 4 – Height of the most lateral point of the sinus; 5 – Projection surface area

**Results:** The greatest transverse diameter of the sinuses was  $25.1 \pm 2.18$  mm on the right side and  $25.3 \pm 2.34$  mm on the left side in male, and  $24.4 \pm 2.27$  mm on the right side and  $24.3 \pm 2.46$  mm on the left side in female. In male, the greatest vertical diameter of the sinuses was  $24.7 \pm 2.43$  mm on the right side and  $24.5 \pm 2.21$  mm on the left side. In female, the greatest vertical diameter was  $23.7 \pm 2.42$  mm on the right side and  $23.8 \pm 2.40$  mm on the left side. Vertical diameter and the height of the most lateral point were greater in male compared to female. In male the most lateral point of the sinus was located higher on the left compared to the right.

**Conclusions:** Left-side craniotomy extended in the frontal direction, particularly in male patients, poses a significantly higher risk of unintended opening of the frontal sinus compared to the right side procedures.

## Spine

ePoster presentation

Syringomyelia: pre- and postoperative MR volumetry as predictor of prognosis after surgical intervention & the pre-, intra- and postoperative course

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**Objectives:** Treatment for syringomyelia usually involves surgery to remove the cause of the syrinx, such as a Chiari malformation or a spinal cord tumor. Physical therapy and medication may also be recommended to manage symptoms and improve quality of life.

Better understanding of the long-term prognosis of surgical intervention and adjuvant therapy may help in decide to reach better prognosis.

**Background:** Syringomyelia is a rare disorder that affects the spinal cord. It is characterized by the presence of a fluid-filled cavity within the spinal cord. The syrinx can expand over time, compressing and damaging the spinal cord, which can cause a wide range of symptoms.

**Methods:** This retrospective single-center analysis includes 15 patients who underwent surgical intervention for syringomyelia. The data was collected from the patients' medical charts. Preoperative and postoperative Syrinx volume was measured by BrainLab software program and gadoteric acid-enhanced MRI to assess the follow-up. The development mechanism of syringomyelia was analyzed by CSF flowmetry in MR CSF Flow sequences.

**Results:** The results of the study showed that, on average, after successfully treating the area of blockage or constriction by surgery the size of the syrinx was regressive. No patient died in the follow-up period. Flowmetry results in syringomyelia showed reduced or altered CSF flow within the spinal cord, which contributed to the development and progression of the syrinx. By flowmetry, the area of blockage or constriction in the spinal cord was identified to approach it by surgical intervention.

**Conclusions:** Overall, surgical intervention is an effective treatment for syringomyelia, and the use of syrinx volume-measurement using MR-volumetry can help predict postoperative syrinx volume and disability score. However, it is important to note that the long-term outlook for people with syringomyelia can vary widely, and further research is needed to better understand the factors that influence the prognosis in this patient population.

## Oncology

ePoster presentation

Spinal ependymoma: pre- and postoperative volumetry as predictor of prognosis after surgical intervention and the pre-, intra- and postoperative course

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**Objectives:** Better understanding of the long-term prognosis after various degree of resection and adjuvant therapy may help in decide upon aggressiveness of surgery to reach better prognosis.

**Background:** Ependymoma is a rare type of cancer (incidence 500 per year in Europe) that arises from ependymal cells outlining the fluid-filled spaces classified as myxopapillary ependymoma or subependymoma (grade I), ependymoma (grade II) and anaplastic ependymoma (grade III). While ependymoma can occur anywhere along the neuro-axis, it is most common infratentorial (60%) typically in the central canal of the spinal cord or the ventricles of the brain (choroid plexus). Age <40 years and extent of surgery appear related to better prognosis, emphasizing the role of surgery as the standard care.

The diagnosis of spinal ependymoma is made based on MRI results and confirmed through pathological analysis after resection.

**Methods:** This retrospective single-center analysis includes 50 consecutive patients who underwent ependymoma resection in the time period between 2012 and 2023. The data was collected from the patients' medical charts. Tumor volume was measured by BrainLab software program and gadoteric acid-enhanced MRI to assess the extent of resection and the association with the long-term prognosis.

**Results:** The results of the study showed that, on average, the mass of resection was above 98% of the total tumor volume. After a median follow-up of 3 years, ependymoma recurrence occurred in 7 patients (4,7%). Adjuvant radiotherapy is indicated in high-grade ependymomas, and is recommended in low-grade ependymomas after subtotal or incomplete resection. In case of radical resection deferral of radiotherapy is decided individually. 45-54 Gy is recommended for low-grade (grade II) and 54-60 Gy for high-grade ependymomas (grade III). Chemotherapy has not shown any benefit.

**Conclusions:** Overall, surgical resection is an effective treatment for spinal ependymoma, and the use of tumor volume-measurement using MR-volumetry can help predict RFS after resection of ependymoma.

## Functional

ePoster presentation

3D-CT reconstruction combined MR-DTI guiding percutaneous stereotactic RFT for TN patients with both cannulation difficulty and high risk of operation

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**Objectives:** To describe a method of utilizing 3D CT reconstruction combined magnetic resonance diffusion tensor imaging guiding percutaneous stereotactic radiofrequency rhizotomy for trigeminal neuralgia patients.

**Background:** The foramen ovale target has been used as a cannulation target in traditional radiofrequency thermocoagulation for trigeminal neuralgia. However, adjustment depending on intraoperative electrophysiology after the needle access the foramen ovale target is unavoidable.

**Methods:** In this manuscript, we described a patient who presented with medically refractory trigeminal neuralgia. On the author's this original work, based our 3D CT reconstruction guiding technology, we developed a new preoperational plan to elucidate the appropriate trajectory via a diffusion tensor imaging data — fractional anisotropy (FA) which can be seen as a prognostic biomarker in the nerve microstructure, and according to its characteristics locate on trigeminal ganglion.

**Results:** The probe successfully arrived at the trigeminal ganglion target with only a single puncture. The patient experienced appropriate pain relief after the operation and did not have any complications related to the procedure.

**Conclusions:** This method maybe a more effective operation process for patients with cannulation difficulty and high risk of operation.



## Trauma

ePoster presentation

### Spontaneous migration of retained intracranial missiles in pediatric patients: experience with 11 cases

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**Objectives:** Our objective is to increase awareness of the risk of spontaneous migration of retained intracranial missiles by reporting our case series of 11 pediatric patients.

**Background:** Spontaneous migration of retained intracranial missiles is uncommon but a potentially serious phenomenon.

**Methods:** We performed a retrospective single-center study on patients treated for intracranial missile injuries between 2000 and 2020 in Palestine with a particular focus on the migration of retained intracranial missiles. Detailed analyses were made of patients' age, sex, type of injurious agents (metallic bullets/rubber bullets/metallic shrapnel from bomb explosion), initial missile position, site to where the missile migrated, radiological and neurological manifestations, complications, treatment modalities (surgery vs. conservative) and functional outcome by Glasgow outcome scale-extended (GOSE) classification at last follow-up.

**Results:** In a cohort of 113 pediatric patients with retained intracranial missiles, we identified 11 pediatric patients with spontaneous migration. Patients' age ranged from 4 to 18 years (mean:  $11.9 \pm 3.7$  years). There were 4 female patients. The missiles that migrated intracranially were metallic bullets ( $n = 6$ ), rubber bullets ( $n = 3$ ), and metallic shrapnel from a bomb explosion ( $n=2$ ). Among the 11 pediatric patients, 8 patients experienced symptoms due to missile migration and were treated surgically, while 3 patients did not develop new symptoms after missile migration and were managed conservatively.

**Conclusions:** In our case series, 11/113 (9.7%) pediatric patients with retained intracranial missiles developed spontaneous migration. Neurosurgeons performing delayed surgery on patients with retained intracranial missiles should be aware of the risk of spontaneous migration and verify the location of the missile after positioning the patient for surgery.

## Endovascular Neurosurgery

ePoster presentation

Recurrent stroke in case of extracranial ICA aneurysm: rare entity

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**Objectives:** Objective of this presentation is to tell about the treatment of extra cranial aneurysm presenting with stroke.

**Background:** Extra cranial aneurysm (Unruptured) is a rare cause of ischemic stroke, and been described only in sparse case reports. The exact pathophysiology, treatment strategies, and prognosis remain incompletely understood. A epidemiological studies showed the incidence of ischemic cerebrovascular disease in unruptured aneurysms is 0.1-2%. The average size of aneurysms is 12.5 mm (5–45 mm), and most of them are located in the anterior circulation. Intra-aneurysmal thrombosis is the mechanism of cerebral ischemia in unruptured aneurysms. Treatment of these type of aneurysm causing brain infarction is controversial. Some cases have been treated surgically, Whereas others were treated conservatively with or without medication. Others treated it with stenting.

**Methods:** A 68/Male patient came with history of Slurring of speech with Mild weakness of right side. He was known case of CVA in past and underwent PTCA 2 months back. He had no history of hypertension or diabetes. Review of systems was negative for headache. He does not smoke cigarette and drink alcohol. He had no familial history of aneurysm. Detail history reveled that he had multiple episode of stroke in last 6 months. MRI Brain was done which showed infarct on left side. CT Angio was done which showed aneurysm, which was confirmed on DSA. stunting was done.



**Results:** Intraoperative and post operative period was uneventful. patient was discharged after 5 days.

**Conclusions:** An Extracranial aneurysm of left internal carotid artery is verified in the present case. It is crucial for all physicians and surgeons to be aware of this entity as the etiology is quite challenging. Antiplatelet therapy may be effective in some patients, and the prognosis can be favourable. Stenting is the preferred over medical or surgical treatment.

## Global Neurosurgery

ePoster presentation

"Polish Medical Team Helping Hand" introduces minimally invasive surgical techniques and implants to Ethiopian neurosurgery, improving the quality of procedures

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**Objectives:** The authors present the results of Polish medical missions in Ethiopia "Polish Medical Team Helping Hand" in the years 2022-2023 on the issue of minimally invasive spinal surgery (MISS) procedures and introducing medical implants, previously unknown in Ethiopia.

**Background:** Editions of "Polish Medical Team Helping Hand" (Figure) took place in 2022 and 2023. During those two missions, a team of doctors and nurses from Poland performed 30 neurosurgical procedures. Procedures were performed in Armed Forces Comprehensive Specialized Hospital in Addis Ababa.



**Methods:** In 2022, a ten spinal (Th-LS) procedures were performed.

Nine cases were gunshot spinal injuries, with instability as a result of facet joints, pedicles and vertebral body destruction. Pedicle screws fusion (6 - 8 screws) was performed using MISS.

One patient was a Th12-L1 spinal subluxation as a result of a parachute jump. The procedure consisted in the removal of the Th12-L1 joints, correction of deformation and fusion by 8 screws using MISS.

In 2023, twenty procedures were performed:

1. twelve MISS pedicle stabilization procedures: 8 gunshots, 2 traffic injuries, 2 cases of instability in degenerative spinal disease
2. six cervical spine anterior fusion and decompression procedures using cages, vertebral protheses and anterior plates
3. two cranioplasty procedures using an artificial cranial bone prosthesis, previously unknown in Ethiopia

**Results:** The following results were obtained:

1. Satisfactory clinical effect in patients of pain relief in cases of instability
2. Satisfactory radiological effect
3. Satisfaction of the Ethiopian medical staff in the subject of education in modern surgical techniques and implants, previously unknown in Ethiopia.

**Conclusions:** Polish medical support for Ethiopia in the issue of modern neurosurgical implants (not used in the Ethiopian public health service) and related surgical techniques indeed raises the standard of treatment, mainly in the field of spinal injuries.

## Neurovascular Surgery

ePoster presentation

### Regular medication as a risk factor for intracranial aneurysms: a comparative case–control study

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**Objectives:** Previous medical history plays a key role in the genesis of intracranial aneurysms (IA). A possible impact of regular medication on the occurrence of abdominal aortic aneurysms has been reported.

**Background:** To evaluate the value of regular medication on the risk of development and rupture of IA.

**Methods:** Data on medication use and related comorbidities were obtained from the institutional IA registry. A 1:1 age- and sex-matched patient sample was collected from the population-based Heinz Nixdorf Recall Study with individuals from the same area. The risk of subarachnoid hemorrhage (SAH) was assessed within the IA cohort.

**Results:** In the analysis comparing IA cohort (n=1960) with the matched normal population (n=1960), the use of statins (adjusted odds ratio, 1.34 [95% confidence interval 1.02-1.78]), antidiabetics (1.46 [1.08-1.99]), and calcium channel blockers (1.49 [1.11-2.00]) was independently associated with higher risk of IA, whereas uricostatics (0.23 [0.14-0.38]), aspirin (0.23 [0.13-0.43]), beta-blockers (0.51 [0.40-0.66]) and angiotensin-converting enzyme inhibitors (0.38 [0.27-0.53]) were related to lower risk of IA. In the multivariable analysis within the IA cohort (n=2446), SAH patients showed higher drug exposure with thiazide diuretics (2.11 [1.59-2.80]), but lower prevalence of remaining antihypertensive medication—beta-blockers (0.38 [0.30-0.48]), calcium channel blockers (0.63 [0.48-0.83]), angiotensin-converting enzyme inhibitors (0.56 [0.44-0.72]), and angiotensin-1 receptor blockers (0.33 [0.24-0.45]). In addition, SAH patients were less likely to be treated with statins (0.62 [0.47-0.81]), thyroid hormones (0.62 [0.48-0.79]), and aspirin (0.55 [0.41-0.75]).

**Conclusions:** Regular medication might impact the risks related to the development and rupture of IA, but the role of duration of underlying diseases and timing of appropriate medications remains unclear. Large multinational registry-based or prospective multicentric clinical trials would be required to clarify the effect of regular medication on IA genesis.

## Education, Ethics, Socioeconomic

Oral presentation

Neuroplastic changes in memory - how animal therapy and benefits of animal-assisted therapy, novel approaches in neurorehabilitation: a narrative review

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**Objectives:** In general, the basis of the theory of synaptic plasticity and neural plasticity or brain plasticity is to include the evolving complexity of synaptic communication.

**Background:** A better understanding of this plastic remodeling is crucial to develop more effective strategies for memory rehabilitation.

**Methods:** We conducted a narrative review that (A) describes brain and memory correlates with respect to neurorehabilitation induced by animal therapy (B) presents neuroimaging and neurophysiological studies that show how the experience of animal therapy may involve recall of emotional moments and enhance memory, and (C) points out the role of perineuronal nets (PNNs) in memory neuroplasticity. Analysis of electrophysiological data has demonstrated brain-wide alterations in functional connectivity in both hemispheres, well beyond the area.

**Results:** We show how memory retrieval and stimulus-evoked effects in animals share a similar neural activity with the PNN, suggesting a causal element in-memory processing.

**Conclusions:** We conclude by considering how the neuroplastic properties of memory may provide context for updating and/or resetting, in memory content and reminiscence-related neurorehabilitation therapy.

## Neurovascular Surgery

ePoster presentation

Surgical resection of a thalamic arteriovenous malformation in a young male in a low resource setting. An illustrative case report

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**Objectives:** Surgical approach to a deep seated thalamic Arteriovenous Malformation in a low resource setting in Western Uganda.

**Background:** The natural history of patients with arteriovenous malformations(AVMs) suggests that 10-17% die due to hemorrhage and 40-50% experience serious physical deterioration of their working capacity in their 20-40 year period after presentation and treatment. Deep basal ganglia and thalamus lesions account for 3-12% of all AVMs and some literature suggests that these lesions have a more hostile clinical course. Studies suggest that the annual risk of hemorrhage in children is higher than that of adults (2-4% vs. 1-3% per year). At Mbarara regional referral hospital (MRRH) , we present a case of AVM resection of a 16/male with a right thalamic AVM who underwent a successful open surgical resection.

**Methods:** 16 year old male, a student with no known chronic illnesses, presented with 15/7 history of sudden onset of severe headache with no known relieving or exacerbating factors. This was associated with episodes of vomiting, altered mentation, there was no history of convulsions, trauma or blurring of vision. On admission: He was sick looking, BP= 109/52mmHg, HR= 60bpm, SPO<sub>2</sub>=96% . GCS=13/15, V=3, PEAL, left hemiweakness with power of 2/5. Cranial MRI: Showed a right thalamic AVM.

**Results:** Surgical resection of the AVM was done and it was a successful operation.

The patient is still under follow up one year down the road. He is completely back to the community and performing well in school.

**Conclusions:** Children who present with intracranial hemorrhage from a previously undiagnosed AVM have a 12% chance of sudden death. Clinical triggers of hemorrhage are unpredictable, but subsequent radiographic evidence of posterior fossa AVMs presented a 57% fatality rate. Even with limited technology, Patients with diagnosed AVM can once again get a chance to survive in LMICs like Uganda.



## Functional

ePoster presentation

### Neurosurgical treatment for trigeminal neuralgia

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**Objectives:** A dilemma might appear during qualification for neurosurgical treatment of trigeminal neuralgia (TN) whether to perform percutaneous radiofrequency rhizotomy (PRR) or microvascular decompression (MVD).

**Background:** The authors present a group of patients treated because of TN with PRR or MVD.

**Methods:** 94 male and 128 female patients were treated with PRR between 2008 and 2020. 46 female and 52 male patients underwent MVD in the same period of time. The mean age in the PRR group was  $63 \pm 22$ . The mean age in the MVD group was  $52 \pm 13$ . The history of pharmacological treatment lasted from one to 32 years (mean 14). The clinical diagnosis was confirmed with MRI. Patients diagnosed with multiple sclerosis, or in advanced biological age, or patients who refused MVD were qualified for PRR. The first treatment option for the rest of the group was MVD.

**Results:** 98% of the patients from the PRR group reported instant improvement after the procedure. 77% of them were pain and medication free at six months follow-up. At two years follow-up 55% of the patients were pain and medication free. 22% required further invasive treatment because of pain recurrence even though patients were pharmacologically treated. 14% of patients underwent another PRR. Three patients reported an anaesthesia dolorosa located at the previous TN region. At the first-month follow-up the whole group of the MVD patient reported improvement. Those patients reported a lack of pain with no need for pharmacological treatment. One patient reported pain recurrence at the three months follow-up.

**Conclusions:** PRR and MVD are safe treatment modalities for TN. A wide variety of surgical approaches may increase the efficacy of neurosurgical treatment.

## Paediatric

Oral presentation

### Neuromodulation of NBIA-related dystonia

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**Objectives:** Medical treatment of Neurodegeneration with Brain Iron Accumulation (NBIA) is frequently ineffective.

**Background:** The authors present a group of patients with diagnosed NBIA- related general dystonia (PANK2 mutation), treated with deep brain stimulation.

**Methods:** Seventeen patients with confirmed PANK2 mutation (NBIA-PKAN) were treated with deep brain stimulation between 2008 and 2022. Age of the patients varied from 8 to 35 years. The clinical condition of the patients was evaluated with scales and video recorded. In all cases the permanent electrodes were implanted in the subthalamic nuclei or globus pallidus. The surgical procedure was undertaken under general anaesthesia. The target was identified with the direct and indirect methods. Intraoperative macrostimulation and microrecording were used for neurophysiological evaluation of the target. Postsurgical local field potentials were recorded in all cases.

**Results:** Neither neurological deterioration nor surgical complications were reported. Caregivers of the patients noted subjective improvement of the clinical state of the subjects that was confirmed with scales. More significant improvement was noted among the STN group compared to the GPi group.

**Conclusions:** Subthalamic or pallidal deep brain stimulation reduces dystonic movements among NBIA patients that include pediatric patients. The technique carries minor surgical risk.

## Functional

ePoster presentation

Long term follow-up after pallidal deep brain stimulation for secondary generalized dystonia

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**Objectives:** The role of pallidal (GPi) Deep Brain Stimulation (DBS) in the treatment of primary dystonia is well established. The results of the GPi DBS for secondary generalized dystonia (SGD) are not that convincing.

**Background:** The authors present a group of three patients diagnosed with SGD and treated with GPi DBS.

**Methods:** Between 2004 and 2005 three SGD patients were treated by the same team because of GPi DBS. The mean age during implantation was  $31 \pm 4$ . Global Dystonia Scale, Fahn-Marsden Movement Scale and Unified Dystonia Rating Scale and Activity of Daily Living scale were used for evaluation. Using MRI guided frame based stereotactic system GPi was identified using the indirect and direct methods. The stimulation was initialized on the first day following surgery.

**Results:** Clinical improvement was noted among the whole group of patients measured with previously mentioned scales and varied from 36 to 85% (mean 56%). The improvement was persistent in the follow-up. One patient with severe neck dystonia reported with displaced connector (from retromastoid region to the supraclavicular region) four months after surgery. The connector was surgically replaced.

**Conclusions:** GPi DBS might be considered as a safe and an effective tool of treatment of SGD in a long term follow-up.

## Spine

ePoster presentation

### Individual 3D-printed navigational templates for pedicle screws placement: results of clinical studies

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**Objectives:** 3D-printed navigational templates is a novel technique for screws insertion which can be a better alternative to more expensive methods. Despite on some studies, a lot of technical details are still questionable.

**Background:** To assess the safety and accuracy of pedicle screws placement using individual 3D-printed navigational templates in all spine levels

**Methods:** All templates were created based on CT data by FDM printing. C2:1st group (free hand) - 23 patients, 44 screws, 2nd group (templates) - 17 patients, 34 screws. C3-7:28 patients, 127 pedicle screws (templates). Th1-12 pedicle screws:1st group (free hand) - 23 patients, 112 screws, 2nd group - 11 patients, 42 screws (bilateral monosegmental templates), 3rd group - 13 patients, 42 screws (bilateral monosegmental templates with additional support on spinous process). L1-5 subcortical trajectory: 1st group (templates) - 19 patients, 66 screws, 2nd group - 20 patients, 64 screws.

**Results:**

C2:1st group grade 0+1 - 65.91% screws, grade 2 - 29.55%, grade 3 - 4.45%, vertebral artery injury - 4 (8.89%) patients; 2nd group - grade 0+1 - 97% (p<0,05), mean deviation - 1.8±1.0 mm. C3-7: grade 0 - 89,76%, grade 1 - 7,09%. Th1-12: 1st group grade 0 - 66,96%, grade 1 - 18,75%, grade 2 - 9,82%, grade 3 - 4,46%; 2nd group grade 0 - 85,71%, grade 1 - 14,29%; 3rd group grade 0 - 90,74%, grade 1 - 9,26%. L1-5: The mean distance between the screw and the cortical plate ranged 1.20–3.97 mm (p>0.05). The mean time of screw implantation was 137.0 [115.25; 161.50]s in 1st and 314.0 [183.50; 403.25]s in 2nd group, the total MIDLIF operation time was reduced from 173.0 [155.0; 192.25] min in group 2 to 119.0 [108.0; 128.75] min in group 1.

**Conclusions:** Individual 3D-printed navigational templates is a safe and obtainable method for pedicle screws placement in all spine levels.

## Education, Ethics, Socioeconomic

ePoster presentation

### Sexism in Russian neurosurgery

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#### **Objectives:**

To determine the structure of perception of the image of a female neurosurgeon in the Russian neurosurgical community.

#### **Background:**

The work is devoted to the problem of gender inequality in Russian neurosurgery.

#### **Methods:**

The study is based on anonymous questionnaire survey of neurosurgeons working in Russia. Authors developed two separate questionnaires for men and women. One hundred and three certified neurosurgeons were interviewed, out of them 53 were men and 50 - women.

#### **Results:**

Male neurosurgeons are on average older, with more work experience, more often have a medical category ( $p < 0.05$ ) and perform a larger number of surgeries independently ( $p < 0.01$ ). Significant differences ( $p < 0.01$ ) between men and women are revealed for all identical questions characterizing the perception of the image of a female neurosurgeon. Women do not experience less confidence in the quality of their work due to gender, but throughout the course of medical training and in the process of work, they regularly face the belief that neurosurgery is not a suitable profession for women. Harassment is not a characteristic phenomenon in Russian neurosurgery. Among the authors of articles in the five most cited Russian neurosurgical journals for 2016- 2018, 20.7% are women, and among the first authors 15% are women.

#### **Conclusions:**

Female neurosurgeons in Russia face with the manifestation of gender discrimination in the professional environment, which is an additional obstacle to the formation of a neurosurgeon. The perception of the image of a female neurosurgeon is significantly different among neurosurgeons depending on their gender.

## Education, Ethics, Socioeconomic

ePoster presentation

### Online education with the use of stream-broadcasting in neurosurgery

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**Objectives:** To evaluate the perception of neurosurgical educational online-course with stream-broadcasting approach.

**Background:** E-education is an integral part of the independent learning process. Recent literature reviews show that stream-the broadcast of what is happening directly from the operating room, has great potential for medical education and is not inferior to traditional lectures. The transformation of practical training for surgical disciplines into a digital context is a complex but promising task for future educational concepts and raises questions: is online learning as effective and efficient as traditional knowledge exchange, what are the advantages and disadvantages of videoconferencing when demonstrating clinical skills? This study presents personal experience of using stream-broadcasting as a method of teaching students in the course of neurosurgery in the conditions of the COVID-19 pandemic and an assessment of this teaching option.

**Methods:**

The study is based on anonymous questionnaire survey of medical students after finishing 7-days basic neurosurgical course, consisted of lectures and stream-translations from the surgical room, ICU and other clinical departments. The questionnaire included 8 statements, 36 students were enrolled in the study.

**Results:** 66,7% valued the sound and video quality as 5 from possible five scores. 55.5% strongly agreed that watching the surgery was the most interesting part of the course. 61.1% considered stream-broadcasting as an useful educational method, only 3.2% were strongly disagree. 44,4% strongly agreed that stream-broadcasting was informative enough to understand the surgical process. 69.4% strongly agreed that form of education was interesting, but only 44.4% strongly agreed, that fully online education is totally adequate for getting appropriate knowledge. 44.4% would prefer the classical format of the course.

**Conclusions:** Stream-broadcasting is an useful tool which can be applied during pandemic as well as conventional educational courses.

## Hydrocephalus

ePoster presentation

A pilot study using a 3D-printed trajectory-guide for external ventricular drain insertion on hydrocephalic patients

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**Objectives:** This study proposes a safe, cost-effective and highly replicable three-dimensional (3D)-printed trajectory-guide to ensure surgical accuracy, which may reduce the complications arising from freehand insertion of external ventricular drain(EVD) or ventriculo-peritoneal shunt(VPS). This study aims to demonstrate the accuracy, safety, and user feedback from using our proposed trajectory-guide on actual patients who require EVDs.

**Background:** 3D-printing technology is increasingly applied in neurosurgery to aid in surgical planning, and neuro-anatomy education. 3D-printing technology may also be useful as a trajectory-guide for neurosurgical procedures such as EVD and VPS insertions.

**Methods:** The 3D-printed surgical guide is created with a biocompatible photopolymer resin using 3D-printing software. Following the conventional steps of an approach for EVD and VPS insertion, a burr hole is placed over Kocher's point. The 3D-printed trajectory-guide is secured over the burr hole. The trajectory-guide helps maintain a trajectory that is orthogonal to the calvarial surface but allows for movement in the coronal plane. Use of the 3D-printed trajectory-guide was applied to 3 patients with hydrocephalus. Outcomes measured include: ease of technical handling, intraoperative events and accuracy of the catheter placement, which was evaluated using postoperative Computed Tomography scans.

**Results:** For the 3D-printed guide for insertion of EVD and VPS, all 3 cases were successfully cannulated on the first pass without need for revision. User feedback was positive in two out of the three cases whereby the operators felt that the jig was easy to use and were confident of their trajectory. The second and third cases each made use of a modified prototype based on the feedback from the earlier cases. This showcases the ability for 3D-printing to produce safe trajectory-guides that can improve surgical accuracy.

**Conclusions:** With the ability to easily modify and create new prototypes with 3D-printing, creation of guides to improve surgical accuracy should be more widely pursued in neurosurgery.

## Global Neurosurgery

ePoster presentation

PREMs and PROMSs experience in a neurosurgery department: a new value-based health care paradigm

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**Objectives:** With the aim of improving the patient experience and the value-based healthcare, the Neurosurgery Service of the University Hospital of Navarra has developed a project based on Value-based healthcare, taking into account the concepts of PROMs and PREMs, together with two external consultors.

**Background:** There is not always a direct correlation between surgical intervention and a greater patient well-being. The concepts of PROMs (Patient Reported Outcomes Measures) and PREMS (Patient Reported Experience Measures) arised to determine those health care factors that have an impact on the quality of life and patient experience

**Methods:** The project is based on 8 days of field research carried out by 2 senior consultants. During this time, the 2 consultants lived with the health professionals and conducted in-depth interviews (duration between 20 and 60 minutes) with 30 patients and companions. The interviews were based on open questions, allowing the patient and the companions to present their experience in as much detail as possible. In addition to the interviews, Safaris (non-participant and participant observations) were carried out in various locations (waiting rooms, admission, hospital ward...)

**Results:** A Patient Journey Map has been prepared, which includes the main interactions that patients and companions have with the Neurosurgery Service, as well as lines of action around 6 key areas: empowerment or training, understanding, well-being, confidence, availability or accessibility and tact and treatment.

**Conclusions:** The patient's experience is closely associated with the expectations of quality of life after the intervention. For all these reasons, it is necessary to attend to other aspects in addition to the purely technical ones in order to improve the patient's experience throughout the entire process.



## Oncology

Oral presentation

### Giant malignant peripheral nerve sheath tumor of the scalp, institutional experience

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**Objectives:** To analyse the difference between clinical course and outcome of the patient with Malignant peripheral nerve sheath tumor of scalp (MPNST) having stigmata of NF1 and without it.

**Background:** Malignant peripheral nerve sheath tumor (MPNST) of the scalp is rare. These lesions are found in association with neurofibromatosis type 1 (NF1) but patients had been reported without NF1 also. There clinical resource may be varied with different outcome.

**Methods:** 25 patients treated over 4.5 years between July 2018 and December 2022 with giant scalp MPNST were included in the study. These patients were retrospectively analysed.

**Results:** Average size of the scalp lesion was  $20 \pm 11.27$ cm. Among these 25 patients with MPNST, 15 were having neurocutaneous stigmata of NF1 [Figure-1,2] and 10 without it [Figure 3,4]. 13 were female and 12 males with an average age of  $38.40 \pm 18.48$  years. 10 patients with NF1 and 6 without it have highly vascular tumours and attained giant size >30 cm. These cases required preoperative DSA and embolization with n-butyl acrylate. Total excision of the tumour was done in all the patients with subsequent radiotherapy. Reconstruction flap did not require re-operation with reconstruction in patients who were preoperatively embolised compared to patient not embolised ( $p=0.02$ ). Metastases within one year were noted in two pts and five patients during next 4 years with NF1 and two of these succumbed to her illness as compared to three patients with recurrence in 4.5 years, without NF1. The rest of the patients are under follow-up with no evidence of disease with a maximum follow-up of 4.5 years.

**Conclusions:** Patients having scalp MPNST with NF1 can achieve larger size with fast progression with higher chances of recurrence and metastases. Patients who were preoperatively embolised following DSA have lesser rotational flap related complication as infection, necrosis and redo-operation as compared to patients without preoperative embolization.

## Global Neurosurgery

ePoster presentation

Challenges of neurosurgical practice in Northeast India. The present situation from neurosurgeons perspective

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**Objectives:** To know the present situation and challenges faced by neuro surgeons in north east india.

**Background:** North east India located in foothills of Himalayas is the land of undulating scenic beauty with mountains and rivers. Traditionally north east india has poor connectivity from rest of the country as mountainous terrain and heavy rainfall more than six months of the year is preventing for a sustainable transport system to connect the mainland to interior part of north east India. The challenges facing neurosurgical healthcare in this part of the country include affordability, infrastructure, medical malpractice, and training and education apart from accessibility. The lack of infrastructure and shortage of trained professionals, the neurosurgeons remain restricted to the state capital and don't want to work in smaller cities and impacting the health care facilities .Very few institute has good infrastructure and most of the hospitals especially in private lacks modern infrastructure. To address these challenges, there is a need for increased investment in facilities, expanding access to specialized equipment, increasing the number of trained staff, and improving the overall quality of healthcare facilities. Collaboration between government, private sector, and non-profit organizations is also necessary to ensure that patients receive comprehensive, high-quality care, regardless of their location or ability to pay. Beside this there is also lack of trained neuroanesthesiologist , neuro radiologist ,neurologist and technicians in this part of the country and is unable to meet the growing demand for their services.

**Methods:** The view point of all practicing's neurosurgeons were collected by detail questionnaire by google form.

**Results:** The present scenario and various challenges faced are analysed.

**Conclusions:** Neurosurgical practise in north east india is more challenging than rest of the country.

## Education, Ethics, Socioeconomic

Oral presentation

### Psychological impact of complications in neurosurgery

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**Objectives:** To evaluate the psychological impact of complications on the neurosurgeons health and address the main factors of stress associated with them in order to elaborate a contingency plan.

**Background:** Neurosurgical complications add stress on the neurosurgeons practice and may have psychological implications which have not been well addressed.

**Methods:** An online survey was carried out among the members of the Spanish Neurosurgical Society in 2022. The questionnaire had 15 questions and was answered by 116 neurosurgeons.

**Results:** 35.3% of the responders were women and 64.7% were men. 9.5% were residents, 14.7% assistants with less than 5 years of experience and 75.8% assistants with more than 5 years of experience. 83.6% worked in a university hospital. Most of the neurosurgeons (69.8%) were more affected by a complication derived from a poor surgical technique than by a casual complication. 56% were more affected by complications in younger patients compared to the other 44% who were equally affected regardless of the patient's age. Most surgeons (78.3%) were more affected by those irreversible complications limiting the patient's quality of life than death. After a complication, 61.9% of neurosurgeons continued to indicate the procedure with the same frequency, compared to 37.2% who tended to indicate it less. The majority (77.4%) visited the complicated patient more frequently than any other patient. The vast majority (94.8%) stated that the patient's and family's reaction was key in how they coped with it. Only for the 35.7% the complications were routinely analyzed in a clinical session. 90% presented psychological alterations that affect their personal life such as apathy, irritability, sleeping difficulty ... lasting between days and weeks. Only 12% had a psychological support team at their workplace and 5% required professional help.

**Conclusions:** The results underline the need to conduct further studies on this subject and make contingency plans to treat this problem.

## Skull Base

ePoster presentation

### Giant skull base meningiomas: diagnostic features and treatment

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**Objectives:** The objective of this class is to define giant skull base meningiomas in their most common topographies in the anterior, middle and posterior cranial fossae and to define the main clinical features and surgical details involved in the surgical planning of giant tumors in the skull base.

**Background:**

Meningiomas are the most common primary tumors of the central nervous system, originating from arachnoid cell clusters. Several treatments for intracranial meningiomas are proposed, with complete macroscopic and microscopic resection being the only possibility of cure. 15 % of meningiomas grow along the sphenoid ridge, 4% along the floor of the middle fossa 10 % developing in the posterior fossa and 5% in the olfactory groove. There are not accurate data about giant skull base meningiomas, but in some regions of the base of the skull it has classic definitions, such as the olfactory groove, anterior clinoid, petroclival region and middle fossa. Defining the size of meningiomas at the base of the skull and its implication in the surgical technique to be performed to avoid postoperative complications is essential.

**Methods:** Literature Review (pubmed) and clinical cases of giant skull base meningiomas operated by our neurosurgical team aiming to illustrate the difficulties related to these types of tumor, as well as the precautions to avoid intraoperative sequelae.

**Results:** Radical resection is obtained in 30 to 55% in olfactory groove meningiomas, 30 % in anterior clinoid meningiomas, 57% in giant petroclival meningiomas. In the posterior fossa various results are present.

**Conclusions:** Giant skull base meningiomas have many definitions. There are many approaches: choose the one you are most comfortable with and that brings the best outcome for the patients, drawing inspiration from the largest series of giant meningiomas by experienced neurosurgeons. Molecular biology is the next step for the adjuvant treatment of meningiomas, associated with radiotherapy and radiosurgery.

## Oncology

ePoster presentation

### Intraosseous meningioma: rare entity

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**Objectives:** To tell about the presentation of intraosseous meningioma.

**Background:** Intraosseous meningioma, also referred to as primary intraosseous meningioma, is a rare subtype of [meningioma](#) that accounts for less than 1% of all osseous tumors. The subset of extradural meningiomas arising from bone is called primary intraosseous meningioma. The present article outlines the clinical presentation, investigation, surgical management, and clinical outcomes of a challenging case of intraosseous meningioma.

**Methods:** 57/M presented with history of headache from last 1 year. No history of seizures, vomiting, vertigo. On ct brain plain there was lesion on right fronto temporal region reported as meningioma. Surgery was done, intraoperatively bony tumor was very hard. There was tumor attached to the dura also. Post operative period was uneventful. Patient discharged after 3 days.

**Results:** Simpson grade 1 tumor removal was done. There was no residual tumor left as seen in post operative ct brain.

**Conclusions:** Benign PIM remains a rarity with unique clinical, radiological, and pathological characteristics that distinguishes it from both intracranial meningiomas and other skull lesions. Skull X-ray plain films can be sensitive for detecting expansile PIMs, with CT and MRI imaging providing detailed characterization. Resection of benign PIM may be indicated for symptomatic relief and/or for diagnostic purposes to differentiate it from other, more concerning, skull lesions; and gross total resection of the involved bone appears to demonstrate at least short-term durable local control for convexity PIMs.

## Global Neurosurgery

Oral presentation

Post-COVID cerebral mucormycosis, varied presentations and surgical strategies of a newer epidemic: an institutional experience

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**Objectives:** To study the various presentations and surgical strategies in treating post-COVID rhino-orbito-cerebral mucormycosis (ROCM)

**Background:** During the challenging second wave of the COVID-19 pandemic, we encountered a most dreadful fungal infection in the form of COVID-associated mucormycosis (CAM), with a varied pattern of presentation from previous experience. Patients presented with simple fungal sinusitis or more complicated brain abscesses, and newer manifestations such as skull osteomyelitis. We report our findings and innovative treatment strategies used to manage this morbid condition.

**Methods:** From May to October 2021, 270 patients with CAM were admitted to Andhra Medical College Department of Neurosurgery, King George Hospital, Visakhapatnam, India. A cohort of 61 cases with intracranial involvement was studied in detail. The varied presentations and different or innovative treatment modalities were analyzed.

**Results:** The death rate was 30/270 in the whole cohort, and three deaths (4.9%) occurred in 61 cases with cranial involvement. Thirty-three (54.1%) of the 61 cases were treated surgically: 17 patients required bone excision (for focal osteomyelitis) and 16 cases required abscess drainage/excision.

**Conclusions:** Post-COVID mucormycosis (especially with intracranial involvement) is a highly challenging entity. A multidisciplinary approach with early and aggressive anti-fungal medication combined with timely surgical interventions offers some hope of overcoming this complex infection in CAM patients. We identified some novel techniques during regular follow-up that have proven helpful in combatting this devastating condition.

## Epilepsy

ePoster presentation

### Adverse events and complications associated with Vagal Nerve Stimulation: an analysis of the MAUDE database

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**Objectives:** In this study, we present the first analysis of the MAUDE database for adverse events and complications related to Vagal Nerve Stimulation (VNS).

**Background:** Drug-resistant epilepsy (DRE) can have devastating consequences for patients and families. Vagal nerve stimulation is used as a surgical adjunct for the treatment of DRE not amenable to surgical resection. Although VNS is generally safe, it has its inherent complications. With the increasing number of implantations, adequate patient education with discussion of possible complications forms a critical aspect of informed consent and patient counselling. There is a present lack of large-scale reviews of device malfunction, patient complaints and surgically related complications available to date.

**Methods:** Complications associated with VNS implants performed between 2011 and 2021 were identified through a search of the United States Food and Drug Administration Manufacturer and User Facility Device Experience (MAUDE) database. We found 3 models available on the database, CYBERONICS, INC pulse gen Demipulse 103, AspireSR 106 and SenTiva 1000. The reports were classified into 3 main groups, "Device malfunction", "Patient complaints" and Surgically managed complications".

**Results:** A total of 5888 complications were reported over the 10-year period, of which 501 reports were inconclusive, 610 were unrelated and 449 deaths. In summary, there were 2272 reports for VNS 103, 1526 reports for VNS 106 and 530 reports for VNS 1000. Within VNS 103, 33% of reports were related to device malfunction, 33% patient complaints and 34% surgically managed complications. For VNS 106, 35% device malfunction, 24% patient complaints and 41% surgically managed complications. Lastly for VNS 1000, 8% were device malfunction, 45% patient complaints and 47% surgically managed complications.

**Conclusions:** We believe the description of complications and literature review in this paper will provide healthcare professionals and patients with an understanding of the scope of the adverse events and complications related to this procedure.

## Oncology

Oral presentation

### Stereotactic radiosurgery for non-small cell lung cancer brain metastases before and after the targeted therapy era

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**Objectives:** We examine our experience with radio surgery for patients with lung cancer before and after the routine use of targeted agents.

**Background:** Stereotactic radiosurgery (SRS) has been integral in treating lung cancer patients who develop brain metastases (BM). However, significant advancements in detecting and treating targetable mutations in non-small cell lung cancer (NSCLC) have been made in the last decade. Such advancements have opened many opportunities for patient treatment options, and must be assessed for proper integration of SRS into current patient treatment plans for NSCLC.

**Methods:** We retrospectively reviewed the charts of 235 patients with BM from NSCLC treated 1 SRS. Primary comparisons were made between patients with and without targetable mutations. The main outcomes of this analysis were patient demographic characteristics, mutation frequency, median survival, and overall survival. Mann-Whitney U and Chi-square testing were utilized where appropriate, with multivariable analysis used to identify independent risks in radiation necrosis/pseudoprogression after SRS. All time-to-event investigations utilized Kaplan-Meier regression.

**Results:** Of the 235 patients examined, 88 (37.5%) had targetable mutations and 147 (62.5%). The most common detected mutations included those in EGFR (40.4%), KRAS (23.4%), and ALK (16.0%). Patients with targetable mutations were primarily female (63.6%,  $p < .001$ ) and primarily non-smokers (59.1%,  $p < .001$ ). Median survival time was higher for those with targetable mutations and SRS (19.9 months vs. 7.7 months,  $p < .001$ ). Pursuing more > 1 SRS courses led to higher median survival compared to patients receiving  $\leq 1$  courses (20.2 vs. 8.4 months,  $p < .001$ ). The median overall survival was higher in those with targetable mutations (23.2 vs. 7.4 months,  $p < .001$ ). In determining radiation necrosis/pseudoprogression risk, only the total number of SRS courses were independent predictors (OR 1.64,  $p = .037$ ).

**Conclusions:** Patients with NSCLC BM with targetable mutations have better outcomes after SRS. Total number of SRS courses received independently increased the risk of radiation necrosis.



## Education, Ethics, Socioeconomic

ePoster presentation

IRCAD Africa - sustainable training in endoscopic and open skull base surgery in Africa

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**Objectives:** Access to surgical care in Low- and Middle-Income Countries (LMICs) such as countries in the Sub-Saharan Africa is still extremely limited which causes a burden on the health care systems. Africa has seen remarkable improvements in health sector in recent years, among others the introduction of innovative solutions. Part of those innovative solutions includes the introduction of Minimally Invasive Surgery (MIS) to increase productivity of surgeons and lessen hospitalization time for patients.

**Background:** Endoscopic Skull Base Surgery has undergone tremendous advancement in the last decade worldwide moving from pituitary surgery to suprasellar lesions and now to a myriad of skull base lesions extending from the cribriform plate to C2 and laterally out to the infratemporal fossa and petrous apex. Evolution of several technological advances as well as advances in understanding endoscopic skull base anatomy and the development of needed surgical skills have fostered this capability.

**Methods:** IRCAD Africa is conscious of the current surgical scene in Africa and understands that there will be several steps to follow and issues to tackle to improve care; its training courses are strictly on Minimally Invasive Surgery (MIS) like its mirror institutions elsewhere in the world including France, Latina America, Taiwan, Lebanon soon China and USA.

**Results:** IRCAD Africa set to be in Rwanda in 2023, will provide training to african surgeons in MIS in various surgical disciplines including Neurosurgery. It will be the first of its kind to offer advanced hands-on 360 cadaveric skull base courses (both endoscopic and Open microsurgery) on the continent. IRCAD Africa brings a world-renowned education, making it accessible to the African surgeons and comes in as a long-term and sustainable solution for the training of african surgeons offering continued innovation and research capabilities.

**Conclusions:** Having an IRCAD, on the continent offers enormous advantages to the African surgeons and Africans in general.

## Trauma

Oral presentation

Does the skull Hounsfield unit predict shunt dependent hydrocephalus after decompressive craniectomy for traumatic acute subdural hematoma?

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**Objectives:** We investigated possible connections between the skull Hounsfield unit (HU) values and shunt-dependent hydrocephalus (SDHC) in patients that received cranioplasty after DC for traumatic acute subdural hematoma (SDH).

**Background:** Posttraumatic hydrocephalus affects 11.9%–36% of patients undergoing decompressive craniectomy (DC) after traumatic brain injury and necessitates a ventriculo-peritoneal shunt placement. As bone and arachnoid trabeculae share the same collagen type,

**Methods:** We measured HU values in the frontal bone and internal occipital protuberance from admission brain CT. Receiver operating characteristic curve analysis was performed to identify the optimal cut-off skull HU values for predicting SDHC in patients receiving cranioplasty after DC due to traumatic acute SDH. We investigated independent predictive factors for SDHC occurrence using multivariable logistic regression analysis.

**Results:** A total of 162 patients (>15 years of age) were enrolled in the study over an 11-year period from two university hospitals. Multivariable logistic analysis revealed that the group with simultaneous frontal skull HU  $\diamond$ 797.4 and internal occipital protuberance HU  $\diamond$ 586.5 (odds ratio, 8.57; 95% CI, 3.05 to 24.10;  $P < 0.001$ ) was the only independent predictive factor for SDHC in patients who received cranioplasty after DC for traumatic acute SDH.

**Conclusions:** Our study reveals a potential relationship between possible low bone mineral density and development of SDHC in traumatic acute SDH patients who had undergone DC. Our findings provide deeper insight into the association between low bone mineral density and hydrocephalus after DC for traumatic acute SDH.

## Education, Ethics, Socioeconomic

Oral presentation

Current challenges in neurosurgical training in the UK and viable solutions for improvement

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**Objectives:** The aim of this study is to analyse current challenges in neurosurgical training in the UK and offer viable solutions for improvement. Specifically, we explore how neurosurgical training has changed through the years and what effect the implementation of the European Working Time Directive (EWTD) has had on neurosurgical training and on trainees' ability to practice neurosurgery independently at the end of training.

**Background:** The goal of modern surgical training programmes has been to deliver surgeons of the highest standards. However, in recent years, there have been a number of political, social, economic and technological changes that have adversely affected the quality of neurosurgical training and the ability to deliver competent and confident neurosurgeons.

**Methods:** Semi-structured interviews were conducted with 10 neurosurgical consultants and 10 trainees from across the UK to document their views on neurosurgical training, on how competency is assessed, on current challenges and how they have affected training, as well as viable solutions for improvement. Furthermore, a PEST analysis was performed to explore different political, economic, social and technological factors that can affect training.

**Results:** Our respondents agree that neurosurgical training has undergone significant changes in the last 30 years and that the implementation of the EWTD has significantly reduced the time trainees spend in hospital, adversely affecting development of competence and confidence in their skills. They also believe that the current competency-based curriculum is viewed as a box-ticking exercise, and they agree that a change is needed. Through the PEST analysis, different factors that affect neurosurgical training are explored in detail and ultimately, we propose viable solutions to make neurosurgical training more efficient within the current working time limitations.

**Conclusions:** There are different factors that pose a challenge to current neurosurgical training in the UK. In this research project we analyse them in detail and offer viable solutions for improvement.

## Hydrocephalus

Oral presentation

### Ventriculoperitoneal shunt failures at Red Cross War Memorial Children's Hospital

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**Objectives:** The failure rate of ventriculoperitoneal shunts is well documented in the literature but no study looking at shunt failure has been performed at our institution. The study was performed to assess our failure rates and to try and improve patient outcomes in the future.

**Background:** Ventriculoperitoneal shunt (VP shunt) insertion is one of the mainstays of treatment of hydrocephalus and although very effective, a high rate of shunt failure persists globally.

The purpose of the study was to quantify the ventriculoperitoneal shunt failure rate at Red Cross War Memorial Children's Hospital (RCWMCH) and assess potential factors contributing to shunt failures.

**Methods:** A retrospective review of VP shunts done at RCWMCH between August 2015 through December 2019 was performed. Operative notes, discharge summaries and patient folders were reviewed to collect information about patient age, aetiology of hydrocephalus, index vs revision shunt, shunt system and other noticeable variables. Overall shunt failure was recorded.

Univariate and multivariate models were used to determine causal relationship.

**Results:** Four hundred and ninety-four VP shunt operations were performed on 340 patients with 48.8% being index shunts and 51.2% revision shunts. Average patient age was 3.4 months. The total VP shunt failure rate over the study period was 31.2%, with a 7.3% infection rate, 13.6% blockage and 3.6% disconnection rate. The most common aetiologies were; Post infectious hydrocephalus 29.4%, Myelomeningocele 19.7% and Premature Intraventricular haemorrhage 14.1%. Orbis-sigma II(OSVII), Distal slit valves and Antibiotic impregnated catheters were used most frequently. Failure rates were highest in the revision group, 34.7% compared to 27.3% in index shunts.

**Conclusions:** VP shunt failure occurs most commonly in revision surgery, and care should be taken at the index operation to reduce failure risk. Surgeon level, duration of surgery, aetiology of hydrocephalus and shunt system used did not influence overall failure rates.

## Education, Ethics, Socioeconomic

Oral presentation

Neurosurgery in the outback: how upskilling general surgeons in Australia's Red Centre can have tangible lifesaving benefits

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**Objectives:** Whether upskilling our general surgical colleagues in the outback can result in lifesaving benefits.

**Background:** Australia's Red Centre is a vast and remote region. It is made up of the southern third of the Northern Territory, eastern part of Western Australia and the northern part of South Australia. No tertiary or quaternary hospitals exist here. Delays in the transfer of deteriorating patients with features of raised intracranial pressure from regional hospitals to quaternary neurosurgical centres has resulted high mortality and morbidity. Most general surgeons are apprehensive to undertake emergency neurosurgery due to lack of know-how and fear of litigation.

**Methods:** We identified emergency neurosurgical conditions that have resulted in mortality due to lack of neurosurgical services in the past decade. We defined the basic neurosurgical procedures that can be performed by general surgeons to stabilize patients until they are transferred to larger centres for definitive care. Using synthetic skull models, fresh pig heads and basic neurosurgery equipment, general surgeons were taught how to perform emergency burr holes and craniotomies, EVD and ICP monitor insertions and the basics of neurocritical care.

**Results:** In total, 5 general surgeons, 4 registrars and 2 nurses were upskilled on the above procedures in a skills laboratory. The results of which were interrogated over an 12-month period. Sixty-four patients with severe TBI or hydrocephalus were transferred to quaternary centres over this period. Emergency neurosurgery was attempted on 13 patients with a range of conditions. These patients were subsequently airlifted to trauma centres. Twelve of these 13 patients survived the journey and one succumbed to their injuries.

**Conclusions:** The availability of cranial access equipment outside major centres has been limited. With the provision of this equipment and the upskilling of surgeons, a tangible lifesaving benefit may be possible.

## Global Neurosurgery

ePoster presentation

### Brain abscess due to *Propionibacterium acnes*: a case report

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**Objectives:** Our objective was to report a rare case of brain abscess due to *Propionibacterium acnes*

**Background:** *Propionibacterium acnes* is a lipophilic bacteria of the commensal skin flora, where it colonizes hair follicles and sebaceous glands. Its pathogenic power is weak but varied: skin, osteo-articular, cerebral, cardiovascular infections. Bacteriological diagnosis is difficult due to the slow growth of this germ and the difficulty in interpreting the results since it is a frequent contaminant of culture media.

**Methods:** We report a rare case of brain abscess due to *Propionibacterium acnes* of a 66-year-old patient.

**Results:** A 66-year-old patient with a history of left frontal meningioma operated in 2011 with notion of recurrence in October 2021 evacuated by surgery. The evolution was marked by the fortuitous discovery of a cerebral abscess on the control MRI in February 2022. The clinical examination was without anomalies. Neurosurgical evacuation of the abscess was performed urgently. The patient was put on triple antibiotic therapy combining vancomycin, cefotaxime and metronidazole. Culture of 2 cerebral pus samples revealed pinkish colonies after 8 days of incubation on enriched media incubated in anaerobiosis and smaller in aerobiosis. Gram staining showed branched Gram-positive Bacilli identified as *Propionibacterium acnes* using the Api ID 32 A system (BioMérieux, France). The antibiotic sensitivity study was carried out according to the recommendations of EUCAST-CASFM 2021 showed that the isolate was to beta-lactams, vancomycin and cotrimoxazole. The evolution was favorable.

**Conclusions:** Although rarely implicated in cerebral abscesses, *Propionibacterium acnes* is a slow culture anaerobic germ to be sought before any cerebral abscess. The immediate sowing of the pus evacuated on culture media enriched in aerobic and anaerobic atmosphere and the prolonged incubation of the cultures facilitate the isolation of this germ and the multiplicity of the samples facilitates the interpretation of the results of the bacteriological diagnosis.

## Education, Ethics, Socioeconomic

Oral presentation

Photogrammetry for reconstruction of high-quality 3D models to aid residents education and intraoperative surgical field documentation and measuring

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**Objectives:** Assess the ability to apply photogrammetric techniques to real-world scenarios in residents' education and intraoperative surgical field documentation and measuring.

**Background:** Photogrammetry is a powerful tool for creating high-quality 3D models that can be used in medical education and intraoperative surgical field documentation and measurement. In the last years the advancements have been develop in medical fields. The accuracy and resolution of photogrammetry models can vary depending on the quality of the photographs, the number of images taken, and the processing software used. Unfortunately, the infrastructure needed for it is expensive and needs the aid of professionals involved in photography.

**Methods:** Materials used were a cellphone with LiDAR technology and the software 3DScanner for image acquisition, and iMac with M1 processor, 8GB RAM memory for 3D processing. The most important step is image acquisition, performed with good illumination and at least 60-100 pictures taken in an ordered fashion. Posterior 3DScanner software is opened and image processing option is clicked. After some minutes depending on the complexity of the model, the model will appear, and some post processing could be performed in Sketchfab a program made to display 3D objects that is free and accessible.

**Results:** 56 models have been produced during the development of this technique. 31 intraoperatively (55%) and the rest inside the laboratory (45%) with several specimens. All models have VR and AR capabilities. Measurements were made in several models to compare with the real models with high precision. 25 students were challenged to use the model with a better understanding of 3D conception.



**Conclusions:** Photogrammetry is a valuable technique that enhances medical education and improves patient outcomes, providing detailed 3D models used for education and surgical planning, improving the skills and knowledge of medical professionals, ultimately leading to better outcomes.

## Oncology

Oral presentation

From novices to experts: our learning curve and clinical outcomes with 250 laser ablations for brain tumors

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**Objectives:** This study analyzes a 250-patient cohort of laser-ablated tumors to describe changes in patient selection, and clinical outcomes over time and experience, with the aim of providing insight into the learning curve for incorporating Laser Interstitial Thermal Therapy (LITT) into a neuro-oncology program and identifying a cutoff point that distinguishes novice from expert performance.

**Background:** LITT has gained popularity as a minimally invasive technique for treating brain tumors. Despite its proven safety profile, LITT is not yet widely available, and there is a lack of data on the learning curve required to achieve proficiency.

**Methods:** We retrospectively reviewed 250 consecutive brain tumor patients who underwent LITT between 2013 and 2022. Demographic and clinical data were analyzed. Kaplan Meier curves were used for survival analysis. Operative time was evaluated using exponential curve-fit regression analysis to identify when consistent improvement began.

**Results:** The patients were divided into quartiles (Q) based on their date of surgery. Mean tumor volume increased over time (Q1 = 5.7 and Q4 = 11.9 cm<sup>3</sup>, p = 0.004), and newly diagnosed lesions were more frequently ablated (p = 0.0001). Mean operative time (Q1 v Q4 = 322.3 v 204.6 min, p < 0.0001), and neurosurgical readmission rate (Q1 v Q4 = 7.8% v 0%, p = 0.03) were reduced over time. The exponential curve-fit analysis showed a sustained decay in operative time after case #74. Extent of ablation (EAO) > 100% was found to be a significant predictive factor of glioblastoma prolonged median overall survival (14 vs. 10.7 months, p = 0.008). The EOA (p = 0.69) the recurrence (p = 0.11), and the overall postoperative complication rate (p = 0.78) did not vary over time.

**Conclusions:** After treating 74 patients, a downward trend in the operative time curve is observed. Patient selection is broadened as experience increases. EOA predicts GBM longer survival.

## Education, Ethics, Socioeconomic

Oral presentation



## Availability of modern neurosurgical equipment and services across the world's most populous country: a survey of expert Indian neurosurgeons

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**Objectives:** This work sought to investigate, first, the availability of 'modern' neurosurgical services and equipment across India, and second, the socio-economic and regional disparities in neurosurgical care.

**Background:** Over thirty million people currently require neurosurgical procedures in India, a statistic not including those requiring interventions for neurotrauma or infection. However, the world's most populous country faces substantial disparities in access to neurosurgical care, driven by a dearth of both staff and neurosurgical equipment considered standard in high-income countries.

**Methods:** A prospective, cross-sectional, survey-based study was carried out in 2023 with a target audience of expert academic and non-academic neurosurgeons across India. Survey forms were designed and disseminated online using JotForm. Data were analyzed using SPSS and reported in accordance with CROSS guidelines.

**Results:** Responses from thirty-one expert neurosurgeons, all at a consultant level, were collected, with a population appropriate mix of both publicly and privately employed neurosurgeons. Less than 50% of consultant neurosurgeons reported presence of catheterization lab facilities at their institution for stroke thrombectomies. 29% reported the availability of stereotactic frames. 42% had the availability of any neuronavigation services. 3% of neurosurgeons reported having access to either a CyberKnife or GammaKnife for stereotactic radiosurgical procedures. 16% had access to 5-ALA for neurosurgical oncology. Only 60% had the availability of standard immunohistochemistry services. Merely 45% reported having routine testing for isocitrate dehydrogenase (IDH) mutation testing for gliomas available at their institution. Other molecular testing was available at merely 35% of the survey respondents' institutions. Substantial regional variation in access to these modern neurosurgical equipment and services was identified.

**Conclusions:** Substantial disparities in access to routine neurosurgical services are present across India, representing the next challenge in global neurosurgery. These disparities are potentially limiting uptake and utilization of modern neurosurgical operations in the world's most populous country, especially for stereotactic, functional, and neuroendovascular procedures.

## Oncology

Oral presentation

### Defining progressive disease in laser ablated brain metastasis: an evidence-based pursuit

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**Objectives:** This study aims to determine when an increase in volume of a post-ablated lesion should be considered as progressive disease.

**Background:** The early postoperative period after laser interstitial thermal therapy (LITT) for brain metastasis is typically characterized by a transient increase in contrast-enhancing volume. However, there is no consensus on how long expected post-ablation edema may persist, which can hinder radiographic assessment. The Response Assessment in Neuro-Oncology criteria suggests that a  $\geq 20\%$  increase in size of brain metastasis (BM) assessed in 6–12-week intervals should be considered PD.

**Methods:** The study identified patients who underwent LITT for BM between 2013–2022, with 42 lesions out of 92 complying with the inclusion criteria. Only patients with follow-up longer than 6 months were included. A receiver operating characteristic (ROC) curve was plotted to evaluate volume change as a predictor of local progression (LP) and to find the optimal cutoff point for LP. Univariate and multivariate logistic regression analyses were used to assess the predictive impact of several clinical variables on post-operative LP. Kaplan Meier (KM) curves were generated to compare cohorts at different timeframes.

**Results:** Twelve (26.7%) of the lesions could not be locally controlled. Within the timeframe of 60–90 days after LITT, volumetric changes did not predict LP (AUC: 0.57;  $p=0.612$ ) and KM curves did not show significance when dichotomized into groups according to volume changes ( $p = 0.63$ ). Further analysis showed that the 120–180 day timeframe after LITT predicted LP (AUC: 0.78,  $p=0.0412$ ). An increase of 25.6% from the baseline volume presented a sensitivity of 70% and specificity of 88.9% for predicting LP. The multivariate analysis confirmed that a 25% increase in volume between 120–180 days was an independent negative predictive factor ( $p = 0.007$ ).

**Conclusions:** A relative  $\geq 25\%$  in volume 120–180 days after LITT is an independent prognostic variable of LP.

## Hydrocephalus

Oral presentation

Proximal ventricular catheter placement in ventriculoperitoneal shunt operations in adults: comparison of anterior vs parietal-occipital point in ventricular catheter malfunction

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**Objectives:** The purpose of this study is to evaluate shunt failure rate due to proximal (ventricular) catheter malfunction, in patients where the ventricular catheter is placed in the frontal horn of the lateral ventricles or through the parietal-occipital approach.

**Background:** Ventriculoperitoneal shunt surgery is a simple solution to the problem of hydrocephalus. Shunt failure and other complications are fairly common and may require multiple surgical procedures during a patient's lifetime.

**Methods:** In a retrospective review of a prospectively maintained, single-center database, we identified all shunt systems implanted for the first time over a 6-year period (2017-2022) and all subsequent revision surgeries due to proximal catheter malfunction with a follow-up of at least 1 year. Patients older than 18 years of age, and patients who survived more than three months were included in the study.

**Results:** A total of 96 adult patients aged from 18-81 years of age were included. Of these 96, in 75 patients, the parietal-occipital approach was used for placement of the ventricular catheter, and in the remaining 21 patients, the anterior approach was used via Kocher's point. The overall shunt revision rate, due to ventricular catheter malfunction was 4.16% (4/96), i.e. 4 patients out of 75 in the group of posteriorly placed shunts, and 0 out of 21 in the group of anteriorly placed shunts. The median time to first shunt revision was 11.25 months. Our finding favor the anteriorly placed shunts, over the posteriorly placed shunts ( $P > 0.05$ ).

**Conclusions:** Previous studies have demonstrated that anteriorly and posteriorly placed shunts have mostly comparable outcomes, but according to our results, shunt survival at 1-year interval favors anteriorly placed shunts. Additional well-designed clinical trials are needed to validate the findings of greater early and/or late shunt failure in anteriorly or posteriorly placed shunts, with more time-dependent statistical measures.

## Skull Base

ePoster presentation

Endoscopic transsphenoidal versus microscopic transsphenoidal surgery in the treatment of pituitary adenomas: comparison of extend of resection and associated complications

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**Objectives:** To present the advantages and disadvantages of the transnasal transsphenoidal endoscopic approach, including the applicable anatomy, compared to the microscopic approaches.

**Background:** The transnasal transsphenoidal endoscopic approach became the gold standard for the majority of the pituitary pathology. The endoscopic approach to the pituitary has redefined accurate visualization of the sella. The panoramic view afforded by the endoscope is unparalleled as compared with the traditional conical view of the microscope.

**Methods:** We conducted retrospective/prospective study during the period of 2010-2018 which included 46 microscopically and 39 endoscopically treated patients. Tumors were classified according to the diameter and clinical outcomes were evaluated.

**Results:** The results demonstrated more efficacious and effective disease control in the endoscopic technique group, especially in secretory active macroadenomas. Further, the extension of the resection, which was better in endoscopic approach undoubtedly contributed to better disease control. Complication rate, including endocrine, was lower following endoscopy compared with microsurgery.

	Extend of resection up to 90%	Extend of resection above 90%	Complications
<b>Microscopic</b>	46/85 (54.11)	0/85 (0%)	16/85 (18.82%)
<b>Endoscopic</b>	16/85 (18.82%)	23/85(27.05%)	3/85 (3.52%)

**Conclusions:** This technique evidenced to have a statistically significant more radical safe resection and complication control. There is also a trend toward improved endocrine outcomes and rate of correction of visual defects. In addition, the use of endoscopes, including multilocular polifilament 3D endoscope, facilitates extended approaches, reaching a delicate skull base lesions that are suprasellar, retrosellar, and parasellar, which permits visualization beyond the abilities of the microscope.

## Oncology

Oral presentation

Fluorescein-mediated sonodynamic treatment effects on brain tumor microenvironment in an orthotopic malignant glioma mouse model

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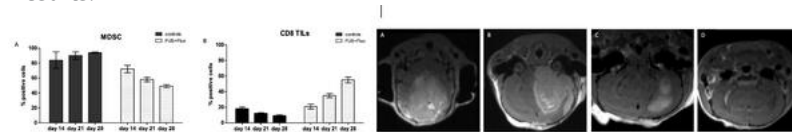
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**Objectives:** Investigating fluorescein-mediated sonodynamic treatment (FL-SDT) immunological effects and effectiveness on an *in vivo* intracranial mouse model of malignant glioma.

**Background:** High grade gliomas (HGGs) are the most common malignant primary brain tumors, associated with dismal prognosis. Innovative strategies have been devised for glioblastoma, and sonodynamic therapy (SDT) is emerging as a promising possible treatment. Fluorescein (FL) use instead of other sonosensitizers is promising as it is applicable to different types of brain tumors. FL-SDT mechanism of action is still unclear, for this reason we evaluated its possible impact on tumoral microenvironment (TME) using an *in vivo* orthotopic murine model.

**Methods:** 24 C57BL6/N mice received intracranial injections of GL261 murine glioma cells. We studied four conditions: fluorescein alone; focused ultrasound alone; FL-SDT, control. TME was evaluated through flow-cytometry of brain samples at three different time-points: day 14<sup>th</sup>, 21<sup>st</sup> and 28<sup>th</sup>. We measured lymphocyte recruitment of both CD3+ CD8+ and CD3+ CD4+ cells, NK, and myeloid-derived suppressor cells Ly6G+ Gr11+ (MDSCs). Afterwards, macroscopical glioma growth was assessed through multiple *in vivo* 7T MRI scans, T1 with gadolinium enhancement and T2, at the same three time-points.

**Results:**



Flow-cytometer analyses show maintained

trend in increasing CD8+ infiltration and MDSCs reduction in FL-SDT treatment group, the opposite in control group. Fluorescein alone or FUS alone show mild influence on TME with inconsistent results. 7T-MRIs performed show no treatment-related complications; moreover T1+gadolinium images display tumor growth inhibition in mouse from FL-SDT group (D), while evidencing tumor growth in fluorescein-only (C), FUS-only (B) and control groups (A).

**Conclusions:** FL-SDT is a feasible technique for *in vivo* treatment of deep-seated intracranial HGGs in murine model. Our findings comprehend macroscopical tumor growth inhibition, associated with modification of TME. Further studies are needed to confirm FL-SDT effectiveness and to clarify its mechanism of action.

## Neurovascular Surgery

Oral presentation

Closure intracranial pressure as a determinant of surgical decompression adequacy in spontaneous supratentorial intracerebral haematoma: a multicentreobservational study

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**Objectives:** Intraoperative intracranial pressure (ICP) measured on closure is a potential objective marker of adequate surgical decompression in intracerebral hematoma (ICH) evacuation, possibly aiding in postoperative ICP management. This study aims to identify and investigate any correlation between closure ICP at decompression surgeries with outcomes in ICH.

**Background:** There currently exists gaps in the literature on optimal surgical management of spontaneous ICH. The conventional thinking of using 20 mmHg as ICP target on closure may not be optimal. Aiming for a lower value of closure ICP at decompressive surgery may improve postoperative outcomes.

**Methods:** Multicenter retrospective study of 203 decompressive surgeries performed for ICHs was conducted. Receiver operating characteristic (ROC) analysis on closure ICP was performed and an optimal threshold was identified to classify patients into inadequate decompression (ilCP) and good decompression (gICP). Postoperative ICP control, modified Rankin scale (mRS) and mortality were reported.

**Results:** ICP threshold of 5 was derived from ROC analysis, 85 patients fell in ilCP (ICP >5 mmHg) and 118 patients in gICP group (ICP ≤5 mmHg). The median preoperative GCS (both groups: 9), ICH characteristics including being left sided (ilCP: 42.2%; gICP: 48.7%), subcortical location (ilCP: 46.4%; gICP: 47.5%), mean ICH volume (ilCP: 53.4cm<sup>3</sup>; gICP: 56.3 cm<sup>3</sup>) were statistically similar.

After multivariate analysis, the need for (OR 2.55 [1.31 – 4.97]) and duration of postoperative hyperosmolar therapy (ilCP: 3 days, gICP: 1 day; p 0.045), re-operation for refractory ICP (OR 5.80 [1.53 – 22]) were more likely in ilCP group. The likelihood of mRS improvement at 1-year follow up also significantly favoured the gICP group (OR 0.38 [0.17 – 0.83], p = 0.015).

**Conclusions:** Closure ICP is an objective and reproducible target at surgery. Aiming for a value of ≤5 mmHg at decompressive surgery is associated with improved postoperative management and optimise functional recovery. Various intraoperative measures can be used to achieve this.

## Spine

ePoster presentation

### Clinical outcome of single-stage decompression and posterior stabilization in thoracolumbar spinal tuberculosis

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**Objectives:** The aim of this prospective study is to analyze the neurologic outcome in decompression, posterior stabilization in thoracolumbar spinal TB in adult patients in our institution.

**Background:** Thoracolumbar spine constitutes the most common site for spinal tuberculosis. Though the treatment of spinal tuberculosis is antitubercular drugs initially, the patient with neurologic weakness warrants definitive surgical procedure of decompression and stabilization. Even though many investigators have reported favorable results with anterior decompression and stabilization surgery, due to the increased morbidity and complications, the posterior-only approach with decompression and stabilization has evolved as the operation of choice in recent time.

**Methods:** All patients aged between 18 and 70 years with clinically and radiologically proven symptomatic thoracolumbar spinal tuberculosis who failed with conservative treatment for 4 weeks or developed neurologic weakness between the treatments are included in this study. All patients were offered decompression and posterior stabilization with transpedicular screws and rods after explaining the above procedure. Clinical outcome was measured by modified Frankel grading; AIS (American Spinal Injury Association impairment score) grade impairment score; and pain assessment done with visual analog scale (VAS) pre- and postoperatively and at 3, 6, and 9 months of interval.

**Results:** The postoperative pain relief, neurologic improvement as per modified Frankel grade, AIS grade, and improvement in erythrocyte sedimentation rate and C-reactive protein were significant as compared with the preoperative status. The surgical interventions thus prove to have adequate relief to the patient and arresting the disease progression. The surgical outcome has very minimal intra- and postoperative complications.

**Conclusions:** Single-stage decompression and posterior stabilization in thoracolumbar spinal tuberculosis is safe, effective, and results in good clinical outcome. The advantages of surgery include thorough debridement, decompression, and achievement of spinal stabilization.

## Trauma

Oral presentation

### Cognitive and functional outcomes of early versus delayed cranioplasty after decompressive craniectomy

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**Objectives:** The aim of the study was to assess cognitive and functional outcomes of early versus delayed cranioplasty (DCP) after decompressive craniectomy.

**Background:** Delay in doing cranioplasty (CP) after decompressive craniectomy (DC) may cause motor, cognitive, and language deficits. Studies show doing CP before developing such symptoms helps in improving the outcome. CP improves cerebrospinal fluid (CSF) dynamics and cerebral blood flow, which may lead to better cognitive and functional outcome.

**Methods:** This was a prospective observational study on 42 patients aged over 16 years and up to 70 years, who had undergone CP after DC for severe traumatic brain injury in in-patient and outpatient department of neurosurgery at a tertiary care hospital in Bhubaneswar, Odisha, India from the period of March 01, 2016 to December 31, 2017. Cognitive and functional outcomes were compared in early and DCP groups in preoperative and follow-up period at 1 month, 3 months, and 6 months. Early cranioplasty (ECP) was within 2 months, and DCP was beyond 2 months.

**Results:** Total sample size under this study was 42; 21 in ECP and 21 in DCP group. Mean age was  $41.40 \pm 15.95$  years. The age distribution was quite young with 38.1% in 30 to 49 age group and had very high proportion of males (85.7%). This analysis revealed that both the ECP and DCP groups have resulted in significant improvement in mini-mental state examination (MMSE) and Glasgow Outcome Scale Extended (GOSE) score after CP. But in the ECP group, there has been steady and significant improvement in MMSE and GOSE score at different follow-ups starting from postoperative 1 month in MMSE score and from 3 months up to 6 months in GOSE score.

**Conclusions:** Neurosurgeon should evaluate and carefully monitor each individual case and take up CP as early as possible with suitable indication.



## Trauma

Oral presentation

Results of early versus delayed decompression for traumatic cervical spinal cord injury: a single center prospective study

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**Objectives:** This study was done with the aim to compare the clinical outcome and patient's quality of life between early (within 24 hours post-injury) versus delayed (after 24 hours to 7 days) surgically treated patients of acute cervical spinal cord injury. The current study was based on the hypothesis that early surgical decompression and fixations in acute cervical spinal cord trauma are safe and are associated with improved outcome as compared with delayed surgical decompression.

**Background:** Prevalence of SCI worldwide is approximately 750 per million with an annual incidence that appears to be rising. This work has translated into the clinical hypothesis that those who undergo surgery in a timely fashion post injury will experience less neural tissue destruction and improved clinical outcomes as compared to injury matched patients treated conservatively or with surgery in a delayed fashion.

**Methods:** A total of 54 patients were recruited and divided into early decompression surgery group A (operated within 24 hours of trauma; n = 25) and late/delayed decompression surgery group B (operated between 24 hours and 7 days of trauma; n = 29). The patients in both groups were followed up, and comparative differences noted in the neurological outcome, quality of life, and bony fusion.

**Results:** The early surgery group had lesser postoperative complications. In group A, 54.17% patients had 1 American Spinal Injury Association Impairment Scale (AIS) grade improvement, while 29.17% experienced > 2 AIS grade improvement (p = 0.015). In group B, the neurological improvement was 50 and 21.43%, respectively (p = 0.003). There was a significant improvement in the postoperative quality of life scores in early surgery group.

**Conclusions:** Early surgery in patients with acute cervical spinal cord injury should be considered strongly in view of the lesser complications, better neurological recovery, and reduced mortality.

## Functional

ePoster presentation

Diagnosis of the risk for ischemic stroke based on thermal model in infrared images

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**Objectives:** In this paper, thermography is used as a non-invasive and cost effective to detect carotid artery Stenosis and thus the risk of stroke.

**Background:** Ischemic stroke is the third leading cause of death and a common cause of hospitalization in the United States of America And is also an important factor for Inability of patients and carotid stenosis is one of the most important factors in creating it. Now, Imaging studies include: Angiography, MRI, CT scan and Doppler ultrasonography , are used to detect carotid artery stenosis that is one of the most important causes of ischemic stroke. However, each method, has unique advantages and disadvantages, that Many of them will have a compromise between performance and accuracy versus easy usage and cost considerations.

**Methods:** This study is was done on a series of thermal images obtained from the Clinical Center in California. In this imaging, the automatic detection of carotid artery stenosis and thus Risk for stroke was done, based on: (1) the difference of average temperature between the right and left carotid arteries in the neck (2) The presence or absence of internal and external carotid arteries.

**Results:** In this study, with the survey conducted by a specialist brain of patients had been previously, the accuracy of this work is confirmed. The techniques and points that are Experimental and scientifically based and obtained in this study, can help to doctors for Early detection of Artery disease, based on analysis of thermal images.

**Conclusions:** The method presented in this paper is considered as a non-invasive and cost-effective method that automatically operates to detect the carotid arteries and prevent the Risk for stroke.

## Spine

ePoster presentation

Providing an automated method for detection of unstable burst fractures of the lumbar spine based on a new thermography technique

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**Objectives:** In this study, we tried to provide a new method for the detection of fractures in infrared images based on k-means and fcm methods.

**Background:** Burst fractures of vertebral are about 15% spine injuries that the most common site is the lumbar dorsal . Now detection of type of fracture and associated injuries usually done by the plain radiography, CT scan and MRI, But these methods have many limitations such as high cost and the risk of radiation.

**Methods:** The present study was performed on a series of thermal images were obtained from a Clinical Center in California, and diagnosis of Unstable burst fractures of the lumbar spine was done based on thermal model and using k-means and Fuzzy C- Means (FCM) clustering methods and Recursive connected components algorithm.

**Results:** In this study, with the survey performed by orthopedic surgeon, that previously was done from the patients , the accuracy of this work is confirmed . Techniques and tips that are practical and based on scientific principles obtained in this study could to help to doctors to diagnose unstable burst fractures of the lumbar spine Based on analysis of thermal images.

**Conclusions:** The method presented in this article can be considered as a non-invasive and cost-effective method for the detection of unstable burst fractures of the lumbar spine.

## Spine

ePoster presentation

### Spinal tuberculosis - a short series of complex multi-level anterior cage reconstructions

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**Objectives:** To present a case series that illustrates four typical examples of the extensive form of spinal tuberculosis and the complex multi-cage reconstructions that can be performed in experienced hands.

**Background:** From a global perspective the epicenter of tuberculosis is in sub Saharan Africa. While largely a pulmonary disease up to 10% of tuberculosis is skeletal. In this skeletal cohort the spinal column is the more frequently involved bony structure and accounts for 50% of cases. Spinal tuberculosis is largely an effectively managed medical disease however in certain cases spinal surgeons must intervene to manage progressive neurology, instability, and progressive deformity.

**Methods:** To describe a case series of 4 patients who presented to our unit with extensive spinal tuberculosis demanding urgent open surgical intervention.

**Results:** Our case series illustrates four typical patients with spinal tuberculosis who had progressive neurology and instability. Through multi-level corpectomies and cage reconstructions we were able to decompress their neural elements, correct their deformity, restore stability, and reverse their often profound neurology.

**Conclusions:** Patients with spinal tuberculosis and HIV infection often present with multi-level spinal involvement. While many benefits from purely medical therapy once sensitivity has been determined, we regard progressive neurology secondary to bony compression, significant deformity or risk of progression of deformity, instability, and large pre- or paravertebral abscesses as indicators for surgical intervention.

## Spine

ePoster presentation

### Minimally invasive spinal surgery in spinal infections - a varied case series

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**Objectives:** To describe and illustrate a case series of 6 patients with spinal infections that were successfully managed by a myriad of contemporary and distinct minimally invasive surgical approaches.

**Background:** The incidence of hematogenous vertebral osteomyelitis is increasing parallel to longer life expectancies, chronic disease, better diagnostic techniques, indwelling intravascular catheters and immunosuppressive therapy. In Sub-Saharan African countries the number of reported spinal tuberculosis cases has tripled secondary to the Acquired immunodeficiency syndrome pandemic.

**Methods:** To present a case series of 6 patients with spinal infections that were successfully managed by newer minimally invasive surgical approaches.

**Results:** The diagnosis of spinal infection begins with obtaining a thorough history and performing a clinical examination. Confirmation of the diagnosis is done through hematological and radiological investigations. The indications for surgical intervention in spinal infections are 1. Significant bony destruction causing instability; 2. A significantly sized para-vertebral abscess where anti-microbial penetration is poor; 3. Progressive neurology secondary to compression; 4. An unacceptable deformity for example kyphosis >20 degrees or listhesis; 5. Septic pseudarthrosis and 6. Failure to respond to 6–8 weeks of medical management. The goal of MISS is to reach the affected target through as minimal a surgical corridor as necessary and in so doing reduce iatrogenic trauma to the surrounding tissues. In so doing the approach-related morbidity of the surgery is minimized leading to improved and earlier clinical recovery.

**Conclusions:** Minimally invasive spine surgery in the context of treating thoracic and lumbar spinal infections is clearly well established. As spinal infections increase in incidence so will papers reporting the use of MISS techniques applied to their management.

## Spine

Oral presentation

### An institutional review of percutaneous stabilization versus open stabilization of unstable thoracolumbar fractures

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**Objectives:** To determine the significance of the minimally invasive percutaneous stabilization of these injuries compared to the traditional open surgical approach in 51 patients admitted over a 5-year period.

**Background:** Thoracolumbar fractures are commonly hyper-flexion distraction/compression injuries and, in the context of motor vehicle accidents, are frequently unstable. The traditional management of unstable thoracolumbar fractures

has been an open posterolateral thoracolumbar instrumented fusion. More recently minimally invasive spinal surgery has been recognised to offer considerable advantages.

**Methods:** Retrospective chart review of 51 patients admitted with unstable thoracolumbar fractures over a 5- year period, 01 January 2014–29 November 2018, 24 of which underwent an open stabilization of an unstable thoracolumbar fracture and 27 of which underwent a minimally invasive percutaneous stabilization of an unstable thoracolumbar fracture.

**Results:** When comparing the open surgical stabilization cohort versus the percutaneous stabilization cohort a significant reduction was demonstrated in Length of surgery ( $p = 0.007$ ); Volume of intra-operative blood loss ( $p < 0.001$ ); Early post-operative pain ( $p < 0.001$ ); Length of hospital stay ( $p = 0.0017$ ) and, One-year patient satisfaction ( $p < 0.001$ ), all of which favored the percutaneous surgery group.

**Conclusions:** Our study confirms the significant intra-operative, post-operative, and 1-year benefit of percutaneous stabilization versus the open approach in unstable thoracolumbar fractures. Our study findings support several other studies which confirm this same benefit. We recommend percutaneous stabilization to be the preferred surgical intervention to manage these injuries.

## Spine

Oral presentation

Motion preservation after cervical total disc replacement surgery-fact or fiction?

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**Objectives:** To determine the demographics, pre-operative range of motion, operative parameters, post-operative parameters, range of motion at 2-years post-operatively, in 27 patients who presented to our unit over a 6-year period who underwent cervical total disc replacement surgery.

**Background:** Symptomatic cervical intervertebral disc disease in younger patients poses a management challenge. Cervical disc replacement surgery aims to preserve cervical motion in younger patients who present with symptomatic degenerative cervical disc herniation.

**Methods:** We performed a retrospective chart review of 27 patients who presented to our unit with degenerative cervical disc disease, from 01 January 2014 – 31 December 2019, who underwent cervical disc replacement surgery. The data collected included patient age; gender; mechanism of injury; clinical presentation; cervical level/s involved; description and site of the disc herniation; length of preoperative symptomatology; preoperative cervical range of motion; length of operative procedure; volume of intra-operative blood loss; amount of immediate post-operative radiculopathy pain assessed by the visual analogue scale; complications; length of hospital stay; and cervical range of motion at 2-year follow-up.

**Results:** The mean age of our subjects was 45.5 (+/-6.5) years. Regarding gender 11/27 (41%) subjects were female and 16/27 (59%) subjects were male. In terms of number of levels 21/27 (78%) subjects had single level surgery and 6/27 (22%) subjects had double level surgery. Considering age categories, patients in the 4th decade demonstrated a statistically significant increase between their pre-operative segmental range of cervical flexion and their post-operative segmental range of cervical flexion ( $p = 0.02$ ).

**Conclusions:** Through the results of our study we report that in our 27 subjects cervical total disc replacement surgery was motion preserving in 100% of our subjects at a 2-year study end point. We further report that all our subjects demonstrated some degree of increase in their segmental ranges of motion in all planes, although this was largely insignificant.

## Spine

ePoster presentation

The role of the minimally invasive extreme lateral lumbar interbody fusion (XLIF) to manage adjacent level disease – a case series

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**Objectives:** To present a series of three patients, all of which had previously undergone an open posterior instrumented lumbar fusion, and now presented to our unit with adjacent level disease.

**Background:** The incidence of adjacent level disease, in patients who have undergone a previous open posterior pedicle screw and rod instrumented fusion, is reported to be as high as 30% at 5-year follow-up. Due to the traditional revision open posterior surgery used to manage these patients being fraught with complications, several studies have compared this to newer MIS interbody fusion techniques.

**Methods:** We present a series of three patients, all of which had previously undergone an open posterior instrumented lumbar fusion, and now presented to our unit with adjacent level disease. Two patients were successfully managed with a minimally invasive XLIF procedure augmented by open posterior decompression and extension of the instrumented fusion, and one patient was successfully managed by a minimally invasive stand-alone XLIF procedure without additional open posterior surgery.

**Results:** Our case series serves to highlight the specific and valuable role of the MIS XLIF procedure, SPECIFICALLY in the context of patients presenting with adjacent level disease.

**Conclusions:** Our favorable result in all 3 patients highlights the specific and valuable role of the MIS XLIF procedure, specifically in the context of patients presenting with adjacent level disease.



## Skull Base

Oral presentation

Mobilisation of anomalous vertebral artery for C1-C2 reduction and fixation: my surgical experience

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**Objectives:** To identify vascular anomalies in deformed joints seen in congenital cranio-vertebral junction anomalies and address them appropriately without compromising the manipulation and fusion of C1–C2 joints.

**Background:** Though vertebral artery (VA) injury may occur in approximately 4.1% patients during surgery at the craniovertebral junction (CVJ), little has been discussed about safeguarding such vessels during dissection of the C1-2 joint.

In this presentation (along with surgical video demonstration) we discuss the operative steps to safeguard the anomalous vertebral artery and strategy eliminates reduce the chances of injury without compromising the C1–2 joint dissection posteriorly, required for reduction and achieving a good bony fusion. We present our surgical experience of **12 cases** where anomalous vertebral artery was mobilized for joint preparation and CVJ fixation.

**Methods:** Preoperative morphometric assessment of the VA for its size, anatomical course, and relationship to the adjacent bony landmarks at CVJ is the well-identified crucial factor for surgical safety and was done in all cases.

**Results:** With the technique discussed, we were able to safeguard the anomalous VA in all our cases.

**Conclusions:** We have described various anomalies of the VA and the operative steps to safeguard it without compromising the C1–2 joint dissection. In the modern neurosurgical era, the VA is no longer identified as a hindrance to approach the atlantoaxial joint.

## Education, Ethics, Socioeconomic

ePoster presentation

Professional integration of the young neurosurgeon in the Beninese health system: the employee of precariousness

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**Objectives:** How do the Beninese neurosurgeons fit into the health care system?

**Background:** Benin has 13 neurosurgeons for a population of over 12 million inhabitants. Basic and specialty medical training is provided in two medical schools in Parakou in the north and Cotonou in the south. But there is not a postgraduate program of neurosurgery in Benin. So, all of them were trained outside Benin.

**Methods:** Through a cross-sectional study, we show the difficulty of uncertain professional insertion of the young neurosurgeon in the Beninese health system.

**Results:** The two faculties of medicine do not have a training unit in neurosurgery. These forces aspiring neurosurgeons to travel to get training. 47% of Beninese neurosurgeons are trained in Morocco, 33% were trained in Senegal. Seven of the 13 neurosurgeons work in the public sector and the majority are located in Cotonou in southern Benin.

There is no employment scheme for young neurosurgeons who return to Benin at the end of their training, which is often done on their own funds. No policy of professional integration is implemented. And the young neurosurgeon does not have the means to set up his own business. He faces many challenges, including the satisfaction of his basic needs. He becomes an employee of precariousness by multiplying contracts of services in private clinics where the practice of neurosurgery is rare and not very profitable. He does not yet have the confidence of patients who do not know him and do not want to be operated on by a young neurosurgeon. All this reinforces the desire to move abroad.

**Conclusions:** Although there is a lack of neurosurgeons for the Beninese population, the young neurosurgeon who decides to return home faces many challenges and seems to be an employee of the precarious.

## Oncology

ePoster presentation

### Hyperprolactinemia as a clinical marker of invasive prolactinomas

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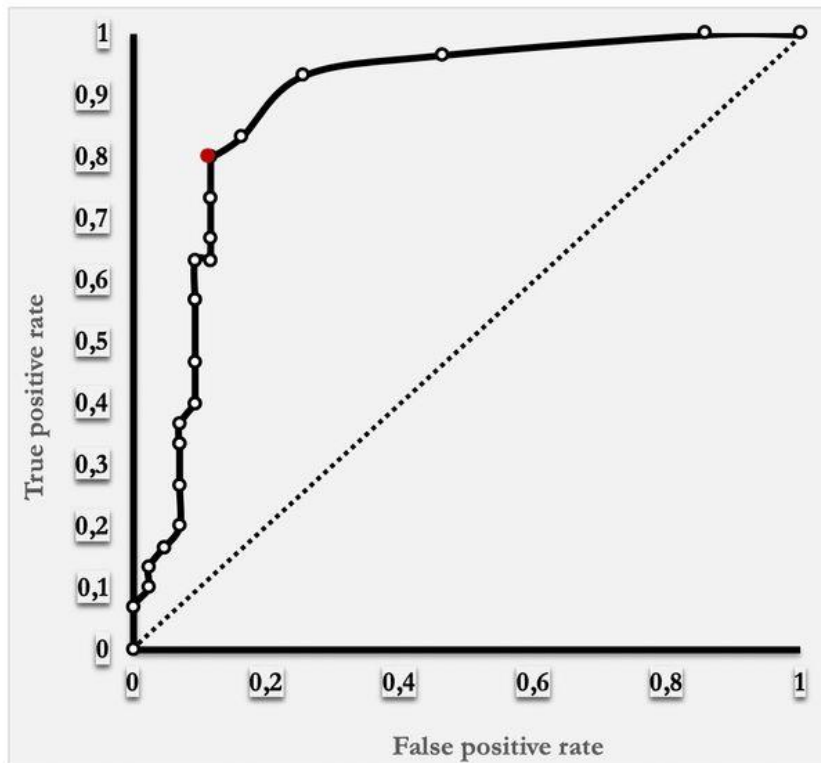
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**Objectives:** Here, we have decided to focus on serum prolactin level and evaluate its behavior in invasive prolactinoma patients.

**Background:** Prolactinomas can acquire an invasion feature and challenge the management. Many features of invasive pituitary adenomas have been investigated in the literature, from radiological, histopathological to molecular perspectives.

**Methods:** It is a retrospective and consecutive view of 75 prolactinomas patients registered at the Hassan II University Hospital of Fez in Morocco. Patients were categorized into two groups: invasive and noninvasive prolactinoma. A non-parametric predicted ROC curve was performed to investigate the sensitivity and specificity of serum PRL level according to the invasiveness.

**Results:** A total of 31 patients (41.3%) represented the invasive group and the mean age was 35.6 years old compared to the group of noninvasive (34,1 years old). Males are more likely to be affected by invasive tumor than women (<0,00001). Serum PRL level was higher ( $2048.6 \pm 1882.4$ ) in invasive prolactinoma ( $p=0.001$ ) and almost all invasive tumors had a PRL level greater than 1000 ng/ml. The predicted ROC curve of the distribution of the serum PRL levels showed an area under curve (AUC) of 89.8% and the calculated value of the threshold to fit a good sensitivity of 80% and false positive rate of 11.6% was estimated to 900 ng/ml.



**Conclusions:** Based on clinical manifestations, hyperprolactinemia and MRI scan, the prolactinoma patients – especially men – presenting a larger tumor size and serum PRL level higher than 900ng/ml, should be considered as an invasive prolactinoma patient. As a matter of fact, with those patients an appropriate treatment should begin as soon as possible.

## Oncology

ePoster presentation

Epidemiology, diagnosis and management of prolactinoma patients in a single medical center of Fez in Morocco

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**Objectives:** This study aims to describe the epidemiological, clinical and therapeutic patterns of prolactinomas based on a clinical work conducted in the largest hospital in Fez.

**Background:** The diagnosis of prolactinoma is usually made earlier for women than men. Indeed, the latter are often diagnosed in an advanced stage of the pathology.

**Methods:** We collected retrospective data of 75 patients from 2015 to 2019 in the Hassan II University Hospital of Fez in Morocco.

**Results:** Prolactinoma was identified among 48.1% of the entire sample of patients with pituitary adenoma, including 69.3% women. The mean age was 33 years old for female patients and 38 for male patients. There were 28 cases of macroprolactinoma, including 27 women, 30 cases of macroprolactinoma and 17 cases of invasive prolactinoma. Hyperprolactinemia was correlated to the size of prolactinoma, whereas giant prolactinomas seemed to produce a serum prolactin higher than 1000 ng/ml. Medical treatment was the management of choice for our sample and only 17.3% patients underwent a surgery procedure through endoscopic, endonasal, transsphenoidal approach. So, dopamine agonist allowed to normalize the prolactinemia, reduce the tumoral volume and restore the symptoms in the majority of our patients.

**Conclusions:** This study identified the epidemiological profile of patients with prolactinoma in Hassan II University Hospital of Fez in Morocco. Young women are typically the population most affected by the disease. Amenorrhea – galactorrhea syndrome's with hyperprolactinemia higher than 200 ng/mL represent significant symptoms for the diagnosis. And the MRI reveals frequently a microprolactinoma.

## Oncology

ePoster presentation

Brain tumors matter: how to improve the management of brain tumors at the CNHU HKM of Cotonou in Benin?

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**Objectives:** We plan to set up a neuro-oncology unit in Benin in order to improve the neurosurgical management of patients with intracranial tumors at the CNHU HKM Cotonou and also to initiate research projects related to brain tumor care in Benin.

**Background:** Cancer care in Benin is still in its inception in Benin. The first cancer registry was created in Benin in 2014. In the study of Egué et al, published in 2019, there were 1086 cases of cancer recorded in the cancer registry in Benin from 2014 to 2016, including 18 cases of nervous system cancer representing 2.3% and 1.2% of cancers in men and women respectively. When compared to other types of cancers including liver and prostate in men and cervix and breast in women, brain cancers appear very low.

**Methods:** We will initiate many clinical research on brain tumors in our center

**Results:** There is no structure dedicated to the treatment of nervous system cancers since there are no neuro-oncologist in Benin and many patients diagnosed with brain tumors are frequently refer outside our country for treatment. Rare patients undergo surgery in our country for brain tumors. Therefore, we can assume that brain tumors statistics are not really indicative of the burden of morbidity and mortality related to nervous system cancer in Benin.

**Conclusions:** The need to organize the management of patients suffering from nervous system tumors is therefore necessary.

## Epilepsy

Oral presentation

The long-term use of diagnostic subdural EEG electrodes and SubduralHematoma (DISEASE): a prospective cohort study

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**Objectives:** To evaluate whether invasive subdural electroencephalogram (EEG) recording leads to earlier seizure detection and treatment initiation in patients with aSDH.

**Background:** Seizures and status epilepticus (SE) are frequent complications of acute subdural hematoma (aSDH) associated with increased morbidity and mortality.

**Methods:** This was a prospective, single-center, cohort trial including patients with aSDH undergoing surgical treatment. In total, 76 patients were enrolled in this study, 31 patients (40.8%) were assigned to the invasive EEG monitoring (iEEG) group and 45 patients (59.2%) to control group. The electrode group was implanted with a subdural strip electrode providing up to 7 days of real-time EEG recording in the neurointensive care unit whereas the control group received regular normal surface EEGs during the 7-day period. The primary outcomes were the prevalence and time to seizures and SE occurrence. Secondary outcomes included neurological outcomes assessed using the Glasgow Outcome Scale (GOS) at discharge and 6-month follow-up and the prevalence of focal structural epilepsy within 2 years after discharge.

**Results:** The trial was stopped after a study committee meeting when the prespecified criteria were met. The iEEG and control groups were well-matched for clinical characteristics at admission. Frequencies of seizures and SE detection were significantly higher in the iEEG group than in the control group (61%vs15.6%, $p<.001$ ; 38.7%vs11.1%, $p=.005$ ). Time to seizure and SE detection was significantly earlier (median 29.2vs83.8h, $p=.018$ ; 17.2vs83.8h, $p=.033$ ) in the iEEG group than in the control group. Favorable outcomes (GOS4-5) were more frequently achieved in the iEEG group than in the control group (58%vs31%, $p=.065$ ). No significant differences were detected in long-term mortality or post-traumatic epilepsy.

**Conclusions:** Invasive subdural EEG monitoring is valuable and safe for early seizure/SE detection and treatment, with improved outcomes in the neurocritical care of patients with aSDH.

## Neurovascular Surgery

ePoster presentation

Outcomes following different types of hemorrhage from cranial dural arteriovenous fistula: presentation of two cases and review of literature

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**Objectives:** - Disclose the outcomes between different types of intracranial hemorrhage due to dural arteriovenous fistula (DAVF) in two cases treated with open surgery and endovascular treatment.

- Expose the meeting points of outcomes after ruptured DAVF in our institution, according to current trends in literature according to Consortium for Dural Arteriovenous Fistula Outcomes Research (CONDOR).

**Background:** It is well known that DAVF may present with intracranial hemorrhage (ICH), but considering it as an unusual pathology, nowadays in our center we still lack of data regarding outcomes in these patients. Spontaneous intracerebral hemorrhage is an important vascular event that might be a life-threatening condition, which justifies the present study.

**Methods:** We present the case of a 53 year old male (Case 1), and of a 47 year old female (Case 2), both which presented to emergencies department with sudden onset headache, and alterations in the state of wakefulness. In both cases, different types of ICH was documented. Both cases required form different management strategies, which are exposed in this study.

**Results:** In the first case, decompressive craniectomy was needed due to increased intracranial hypertension, subsequently, evidence of an extra-intradural shunt was documented, management was then completed with transarterial embolization. In the second case, patient did not required open surgery, she underwent cerebral angiography that demonstrated shunt between left transverse sinus with occipital and ascending pharyngeal branches of external carotid artery, occlusion was then achieved with transarterial embolization.

**Conclusions:** DAVF presenting as intracranial hemorrhage are a rare pathology in our institution, therefore there is no consensus on their management. The aim of these study is to present the outcomes (Which have a broad spectrum), as well as review trending literature on the topic, in order to understand and try to establish a consensus on the management of these cases, which will translate into better prognosis.



## Oncology

ePoster presentation

Diagnostic value of pterin compounds in urine of patients with brain tumors treated surgically

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**Objectives:** The study aimed to determine the levels of five pterin compounds: neopterin, biopterin, pterin, xanthopterin, and isoxanthopterin, to determine their diagnostic value for patients treated surgically for intracranial tumors.

**Background:** Pterin compounds play a role in the development of inflammation and many diseases. Their role in cancer remains unclear. Pterin compounds are found in urine, which facilitates further research on them, as urine collection is entirely non - invasive.

**Methods:** The levels of the parameters in were measured in urine samples. Two measurements were taken, one preoperatively, and the other – 48 to 72 hours following the surgery. The study group consisted of 107 patients with intracranial tumors, while the control group consisted of 33 participants with no neoplastic disease. 48 gliomas, 30 meningiomas and 29 metastatic neoplasms were diagnosed in the study group. In the study group there were a total of 77 malignant neoplasms (gliomas and metastases) and 30 low-grade neoplasms (meningiomas).

**Results:** Patients with high-grade neoplasms, as compared to patients with low-grade neoplasms, were found to have significantly lower concentrations of neopterin, biopterin, pterin, and isoxanthopterin. In addition, with the use of logistic regression models and ROC plots, the diagnostic value of low concentrations of urinary isoxanthopterin was confirmed for assessing the malignancy of intracranial tumors. With the use of ROC curves, it was also possible to show that high urinary levels of isoxanthopterin can be a predictor of perioperative complications.

**Conclusions:** Neopterin and isoxanthopterin levels measured in urine are of potential diagnostic value for diagnosing brain tumors, while isoxanthopterin is also a potential marker of the intracranial tumor's malignancy. Furthermore, urinary isoxanthopterin levels are of potential value for predicting adverse perioperative outcomes. Based on the results obtained in the present study, of all the pterin compound levels measured in urine, isoxanthopterin seems to have the greatest diagnostic and predictive value.

## Education, Ethics, Socioeconomic

Oral presentation

Do neurosurgeons receive more patient complaints than other surgeons? Evaluating risk-taking behaviour between 2018 and 2022 in UK neurosurgical units

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**Objectives:** The study investigated:

whether neurosurgery results in a higher proportion of patient complaints and safety incidents, relative to other surgical specialties;

whether this translates into a greater propensity for risk-taking behavior;

educational improvements for procedures to be performed with higher levels of safety.

**Background:** The neurosurgical field has advanced via creativity, ingenuity, and the willingness to take risks. Whilst these values have contributed to advancements, it is important to consider whether they promote excessive and ultimately adverse risk-taking behavior.

This study evaluates risk-taking across four surgical specialties; neurosurgery, orthopedics, cardiothoracics, and vascular. The study gathered patient complaints and safety incidents from 51 NHS Trusts across the United Kingdom.

**Methods:** - 132 NHS Trusts identified as able to perform one or more of the surgical specialties;

- Responses received from 103 of 132;

- Of 103, 25 invoked exemptions under S.12 FOIA;

- Of 77, 26 exclusions were made where trusts provided incomplete data;

- Results draw on 51 Trusts;

- The data reviewed 1,454,911 operations between 1st January 2018-31st December 2022.

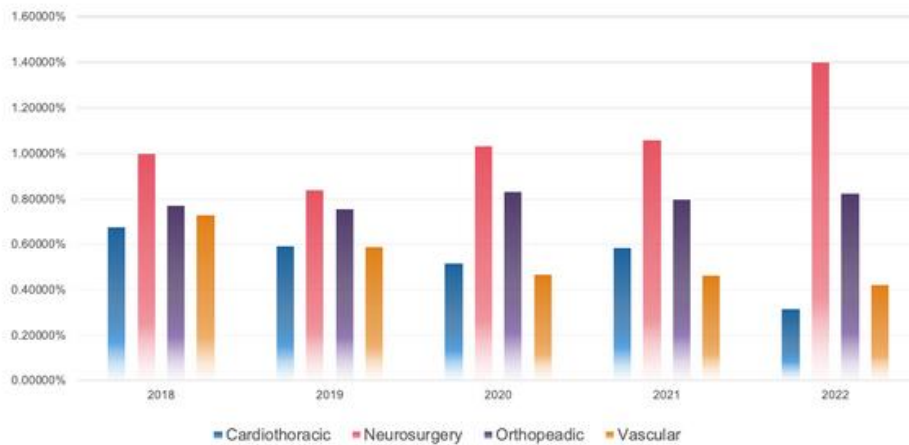
**Results:** Neurosurgeons had the highest number of patient complaints per operation (1.41%), relative to orthopedics (1.05%), cardiothoracics (0.90%), and vascular (0.71%).

Cardiothoracics had the highest number of patient safety incidents per operation (24.04%), relative to neurosurgery (20.81%), vascular (16.61%), and orthopedics (9.47%).

A breakdown of incident data shows neurosurgery experienced the greatest increase in patient safety incidents – 20.71% (2018), 21.49% (2019), 23.49% (2020), 25.47% (2021), 25.00% (2022).

A one-way ANOVA determined statistical significance.

ITEM 1: GRAPH TO SHOW THE RATE OF PATIENT COMPLAINTS RELATIVE TO NUMBER OF OPERATIONS, ACROSS FOUR SURGICAL SPECIALTIES, AT 51 NHS TRUSTS, BETWEEN 2018-2022



**Conclusions:** Neurosurgery exhibits greater risk-taking behavior, when measured by patient complaints and safety incidents, relative to orthopedics, cardiothoracic, and vascular. This was attributed to poorer communication and support for risk-taking behaviors. Recommendations include a consistent risk assessment tool, risk management training, and utilization of predictive analytics to identify high-risk patients.

## Skull Base

Oral presentation

Reconstruction of skull base in craniofacial clefts surgeries, our experience in 31 patients with craniofacial cleft

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**Objectives:** A craniofacial cleft is “a fissure of the soft tissues that corresponds as a general rule with a cleft of the bony structures.” Cleft repair is necessary for encephalocele treatment and cosmetics. These surgeries remain a challenge in skull base surgery. Our surgical treatment experiences are presented to these patients.

**Background:** The Craniofacial cleft repair is necessary for the treatment of encephalocele. The outcomes are additionally impacted by the best soft tissue and craniofacial skeletal appearance without brain parenchyma injury or potential hazards like meningitis. There are some methods for the repair of these anomalies. Many hints could reduce the risks of the operation. we share our experience with 31 patients in three years.

**Methods:** This retrospective study included patients who had undergone surgery for craniofacial cleft between 2016–2020. Patients have all been classified according to the Tessier Classification and have undergone classical or tailored surgical procedures.

**Results:** There have been 31 craniofacial cleft operations in our department, fifteen of them had Tessier 13, and their mean age at surgery was 17 years old. 28 patients have hypertelorism and others were operated on with pure encephalocele. the most post-operative complication was CSF leak and the second was bacterial meningitis. 8 patients were operated on with a tailored technique to avoiding get close to the skull base and all repairs were done with the orbital and frontal bones utilization.

**Conclusions:** A milestone in these surgeries is the use of prophylactic techniques to avoid getting close to the skull base when approaching these patients. We recommend double-checking for CSF leaks at the end of surgery. Endoscopy and CT cisternography are useless.

## Endovascular Neurosurgery

Oral presentation

Solubra 'PINCHING' technique for medium vessel occlusions (MeVOs): a single center experience

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**Objectives:** To assess efficacy and safety of modified solubra technique by using a stent-retriever with smaller profile aspiration catheter for MeVOs thrombectomies at a tertiary-level-center.

**Background:** The widely used, isolated stent-retriever technique for management of acute ischaemic stroke secondary to the medium vessel occlusions (MeVOs) carries a high risk for spasm, clot-fragmentation and distal migration. The use of stent-aspiration technique (Solubra) is limited for MeVOs.

**Methods:** We retrospectively analyzed our prospective database for MeVOs (M2/3 MCA, A2/3 ACA, P1/2 PCA) who underwent endovascular mechanical thrombectomy using modification of solubra technique. Technique involves stent deployment, clot localization following blind navigation of an appropriately sized lower profile aspiration catheter over stent bare wire to "pinch" the primal end of clot. Besides demographic parameters, we collected final recanalization scores(mTICI) with first pass effect. All intra-procedural complications (haemorrhage, vasospasm) were analysed. Clinical outcome was analysed using modified-ranking-score(mRS) on 7th day postprocedure/discharge and at 90 days.

**Results:** Total 23 MeVOs were successfully treated in 21 patients since January 2022 (Male:female 10:3, mean age 59.5 years, mean NIHSS 10.1). Majority of procedures were done for M2 MCA occlusions. Final first pass mTICI 2c/3 recanalization was achieved in 20 patients (95.2%). Intra-procedural complications were observed in 3 patients. Favorable modified-ranking-score (mRS 0-2) was achieved in approximately 80% patients at 7 days and 76% at 90 days.

**Conclusions:** Modified solubra technique, using a smaller profile aspiration catheter can be effectively used for MeVOs with significantly enhancing the first-pass recanalization and reducing the risk of intimal injury, dissection and secondary embolization.

## Peripheral

Oral presentation

Novel technique for reliably restoring peripheral nerve function while permanently eliminating chronic neuropathic pain

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**Objectives:** Develop a technique that reliably restores sensory and motor function under presently impossible conditions while eliminating chronic neuropathic pain.

**Background:** Sensory nerve grafts are the the clinical "gold standard" technique for attempting to restore sensory and motor function to peripheral nerves with a gap. However, their efficacy is limited to short gaps, repairs performed with a short delay following nerve trauma, and young patients. As the value of any variable increases, recovery decreases. However, there is little to no recovery when the values of 2-3 of the variables simultaneously.

**Methods:** Clinically, nerve gaps were bridged with a sensory nerve graft within an autologous platelet-rich plasma (PRP) -filled collagen tube.

**Results:** The technique was applied to 15 subjects, 18-71 years old, with 26 nerve gaps of 4-16 cm, with repair delays of 0.1-5.4 years. 100% of the nerves restored S3-4, including 79.2% sensitivity to  $\geq 4$  of 6 different types of sensory stimuli, and 66.7% restored s2PD of 2-15 mm. Following repair delays  $\leq 8$  months, 75% of the nerves restored M3-5. Although before surgery 75% of the subjects suffered chronic neuropathic pain of  $7.8 \pm 1.8$ , post-repair pain was  $0.5 \pm 1.7$ , with 8.3% having long-term pain reduction and 91.7% long-term pain elimination. These recoveries developed despite 74% of the patients having the values of all three values simultaneously larger than when they normally reduce or prevent axon regeneration and recovery.

**Conclusions:** This novel technique reliably promotes good to meaningful to normal sensory and motor function to 100% and 75% of the subjects, respectively, patients under conditions where no other techniques are effective. Simultaneously, it induces long-term chronic neuropathic pain reduction/elimination in 100% of the subjects.

## Oncology

ePoster presentation

### Assessing inter-observer variability of the S-I nomenclature for network-based neuro-oncological surgery: a study on reproducibility and agreement

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**Objectives:** The objective of this study is to assess the inter-observer variability of the S-I scale.

**Background:** The integration of the human connectome paradigm into surgical neuro-oncology has created the need for a standardized nomenclature. The Sughrue-Ivan (S-I) scale was developed to assess multi-part cortical-based networks based on their structural connectivity. However, the reproducibility of this scale has not yet been evaluated.

**Methods:** The inter-observer variability was evaluated using weighted Cohen's  $\kappa$ -coefficient (Kw) scores and Spearman's correlation test. The Kw scores were interpreted as indicating poor to fair agreement ( $< 0.40$ ), moderate agreement ( $0.41-0.60$ ), and good to very good agreement ( $> 0.61$ ). Two raters, an expert and a novice, independently scored the tumor's relation to the connectomic structures of six networks: language, central executive, salience, dorsal attention, default mode, and ventral attention network. Connectome analysis was performed using Quicktome, a machine-learning platform. Each component of the network was scored from 1 (component not near the lesion) to 5 (lesion completely envelops a component), following the description provided in the seminal paper.

**Results:** A total of 40 MRIs with 1200 data points were assessed. The mean age at surgery was 62.6 years, and the pathologies of the patients included metastasis (45%), glioblastoma (45%), and low-grade glioma (10%). Furthermore, 55% of the patients presented a preoperative neurological deficit, and the median overall survival was 24.1 months. The inter-observer agreement for the S-I score was good, with a Kw value of 0.69 (95% CI 0.63 – 0.75,  $p < 0.001$ ). Additionally, Spearman's correlation test showed a significant correlation ( $p < 0.0001$ ) with an r-value of 0.73 (95% CI 0.69 – 0.76).

**Conclusions:** In contrast to Spearman's correlation, the Kw coefficient considers both the percentage of agreement and the percentage of agreement that could occur by chance. The S-I score demonstrates good inter-observer agreement.

## Global Neurosurgery

Oral presentation

Atlas neurosurgical navigation system: bedside neurotrauma navigation for global settings

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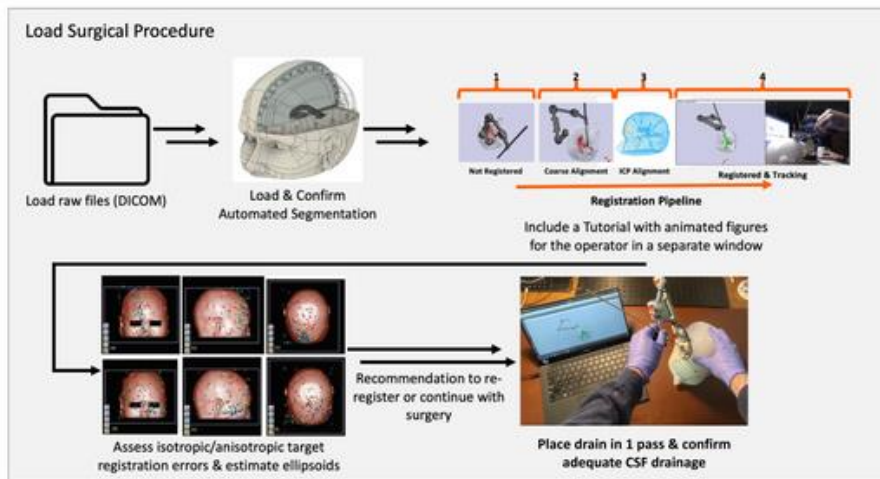
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**Objectives:** We aim to develop a neurosurgical navigation system that can provide the benefits of image-guided navigation for external ventricular drain (EVD) placement in trauma indications with a cost-manageable and bedside-capable approach for low-income environments.

**Background:** We propose a new type of navigation system designed to perform navigated EVD placement at the bedside using a novel kinematic coordinate measuring instrument with a handheld, 4 DOF kinematic arm. The arm is manually actuated, and can be incorporated into the bedside freehand EVD placement procedure using a laptop or tablet and the kinematic arm in a modified cranial access kit. We aim to validate the accuracy of localizing the system effector by using a 3D printed phantom head with a set of targets.

**Methods:** A system was constructed from aluminum and utilized a Raspberry Pi Zero W to connect to 4 digital angle encoders. To validate the system, we bolted the arm to a phantom head, and using the anatomical features of the face, the system was registered to a 3D model of the head using a 2-phase registration process similar to StealthStation (Figure 1). Target points modeled in the head were then collected, and target registration error (TRE) was calculated using the root-mean square error (RMSE). This process was repeated for 30 trials, and time required for registration and TRE were reported.





**Figure 1.** Surgical software workflow with Atlas. Navigation utilizes a laptop for visualization. Ventricles illuminate in green when the catheter is aligned.

**Results:** Across 30 trials on the phantom head, the average time for registration was  $16.07 \pm 3.69$  seconds and TRE was calculated as  $1.811 \pm 0.451$  mm.

**Conclusions:** Overall, these results show potential for this system to be accurate in EVD placement at the bedside for indications involving increased intracranial pressure, and additionally for other trajectory-based procedures. Future cadaver studies and high-fidelity phantom studies will provide accuracy results for realistic anatomical and physiological conditions.

## Oncology

ePoster presentation

Evaluation of intraoperative ultrasound ultrasonography in the rate of complications and tumor resection in patients undergoing surgery with glioma tumor

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**Objectives:** This prospective study included 19 patients diagnosed with glioma who had undergone gross total resection with ultrasound-guided surgery between 2019–2022.

**Background:** Intraoperative ultrasonography (IOUS) is attractive to neurosurgeons due to its non-invasiveness, affordability, and the possibility of repeated use during surgery without significant time consumption. Despite the existence of important challenges in the use of IOUS, one of the attractions of this modality is the real-time imaging of the lesion. Real-time intraoperative ultrasonography significantly helps the surgeon to identify the real-time location of the mass and close structures, like ventricles and falx cerebri.

**Methods:** Between 2019 and 2022, 29 patients with intra-axial brain tumors were collected regarding the possibility of gross total resection of tumors in these cases. Tumor resection was performed using IOUS. Within 72 hours after the surgery, an MRI was performed to evaluate the extent of resection.

**Results:** There were 7 women and 12 men, whose average age was 46.5 years (average 40 years for women and 50 years for men). Most of the patients were middle-aged adults. Regarding the alertness and functional status of the patients, the average GCS was 13, and the median GCS of the samples was 14. The minimum GCS was 9. Also, the median KPS of the patients was 80, the minimum of 10, and related to the same patient with glioblastoma recurrence. It was observed that resection of GTR is related to the amount of dysphagia experienced by the patient after surgery. It was also observed that the extubation rate in women is significantly higher than men. The study did not find any correlation between complications and the amount of tumor resection or bleeding, nor hospitalization of patients.

**Conclusions:** The IOUS can be considered a method that does not have significant complications but can contribute to the improvement of the extent of resection.

## Global Neurosurgery

Oral presentation

Analysis of the Caribbean neurosurgery workforce: scope of practice, challenges and ways forward

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**Objectives:** Our aim is to understand the current scope of neurosurgical workforce for providers in the Caribbean and neighboring countries as sparse information has been published. We sought to highlight challenges and ascertain potential solutions for upscaling the workforce so Caribbean neurosurgeons can provide the best care for their patients.

**Background:** The neurosurgical workforce in the Caribbean and surrounding countries has largely been unknown due to the diversity in cultural, linguistic, political, financial disparities and colonial history in the region. There are ~ 45 neurosurgeons for 16 million people in the Caribbean Community and Common Market (CARICOM), underlining the health inequalities in the region.

**Methods:** This study surveyed neurosurgeons within Caribbean countries and surrounding countries, online using qualitative and quantitative methods via Qualtrics.

Country	Population	Neurosurgical centra (Range)	Median FTE neurosurgeons (Range)	Median FTE neurosurgeons per 100 000
Haiti	11 402 533	1 (1,1)	5 (5,5)	0,04
Guyana*	746 955	1	1	0,13
Guatemala	16 604 026	5 (2,6)	34 (34,34)	0,2
Surinam*	598 000	1	2	0,33
Honduras	7 961 680	8,5 ( 5,12)	43	0,54
Nicaragua	6 545 503	3 (3,5)	40 (35,45)	0,61
Curacao*	153 671	1	1	0,65
Dominican Republic	10 738 957	5 (5,7)	73 (70,76)	0,68
Costa Rica	5 047 561	9 (5, 10,5)	35 (30,36)	0,69
Puerto Rico	3 193 694	8 (6,9)	22 (20,23)	0,69
Barbados	287 371	1 (1,1)	2 (2,2)	0,7
Jamaica	2 734 092	4 ( 4,4)	20 (20,20)	0,73
Trinidad and Tobago	1 367 558	3 (3,3)	10 (10,13)	0,73
Belize*	390 353	1	3	0,77
El Salvador	6 453 550	7 (3,9)	50 (32,61)	0,77
Grenada*	135 115	1	1	0,77
Cuba	11 333 484	20 (19,21)	100 (91,100)	0,88
Aruba*	111 050	1	1	0,9
Panama	4 246 440	6 (5,12)	40 (39,40)	0,94
Saint Vincent and the Grenadines	101 390	1 (1,1)	1 (1,1)	0,99
Bahamas	389 410	2 (2,2)	4 (4,4)	1,03
Cayman Islands*	65 786		1	1,52
Martinique	374 912	1 (1,1)	6 (6,6)	1,6
Saint Lucia	183 629	2 (1,3)	3 (3,3)	1,63
Guadeloupe	400 002	2 (2,2)	8 (8,8)	2

**Results:** Of 38 countries within the Caribbean and surrounding countries, 26 (68%) were surveyed of which 18 (69%) replied. In total 172 regional neurosurgeons were identified of which 61 (35%) replied - with most being general neurosurgeons (56%). Remarkably, most countries failed to meet the threshold workforce density for safe health care - either expressed by FTE (full time equivalent) neurosurgeons or neurosurgical centers. Most neurosurgical practices confirmed receiving or sending medical referrals. If so, most referrals took longer than 8 hours without significant differences regarding the destination. Lastly, challenges confronting neurosurgical advancement were found in: technology and equipment (40%), trained personnel (31%), hospital infrastructure (14%), education and training (44%).

**Conclusions:** To our knowledge, this is the first comprehensive qualitative and quantitative study exploring the current status of the neurosurgical workforce within the Caribbean and surrounding countries, the challenges and the potential ways forward. Creating awareness of the neurosurgical workforce with the available resources and challenges will aid in developing neurosurgical care to a better standard within the region.

## Oncology

ePoster presentation

### Supramaximal versus gross total resection in grade 4 astrocytomas, effect on overall and progression free survival: systematic review and meta-analysis

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**Objectives:** To synthesize the evidence on the impact on PFS and OS of SMR over GTR in Glioblastoma, IDH wild-type, and Astrocytoma, IDH-mutant, grade 4 (Glioblastoma).

**Background:** Glioblastoma represent the most frequent group of primary malignant brain tumors. They are aggressive and resistant to therapy, with a corresponding very poor prognosis. These tumors appear as contrast-enhancing lesions surrounded by a T2 hyperintense signal of variable shape and extent on magnetic resonance imaging (MRI). The T2 signal is thought to correspond to infiltrated tissue. Surgery has classically been directed towards a gross total resection (GTR) of the contrast-enhancing part of the tumor. Accumulated data show the benefit of GTR over partial resection or biopsy, with a gap in knowledge as to whether resection of T2 hyperintensity could add additional improvements in progression-free survival (PFS) and overall survival (OS), giving rise to the concept of the benefit of a supramaximal resection (SMR).

**Methods:** The PubMed, Scopus, Web of Science, Ovid, and Cochrane databases were systematically searched (up to November 30, 2022). Studies reporting OS and PFS on adult humans with a suspected Glioblastoma, treated either with a SMR or GTR were included. Hazard ratios were estimated for each study and treatment effects were calculated through DerSimonian and Laird random effects models.

**Results:** The literature search yielded 14 studies published between 2013 and 2022, enrolling a total of 6779 patients. Analysis of the included studies reveals significantly better clinical outcomes favoring SMR over GTR in terms of PFS (HR 0,67; p = 0,0007), and OS (HR 0,7; p = 0,0001).

**Conclusions:** Glioblastoma, IDH wild-type, and Astrocytoma, IDH-mutant, grade 4, are aggressive tumors with a very short long-term OS. SMR is an effective therapeutic approach contributing to increases in PFS and OS in patients with this catastrophic disease.

## Global Neurosurgery

Oral presentation

### Mapping the global neurosurgery workforce

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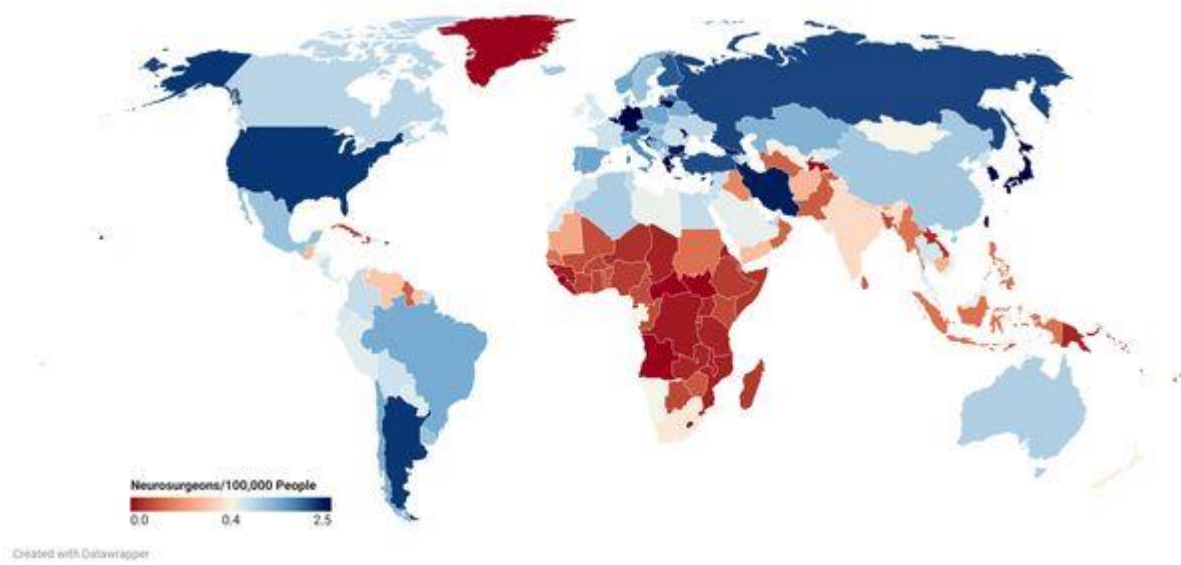
**Objectives:** We sought to quantify the current global neurosurgery workforce and temporal trends in the last decade.

**Background:** There has been a push to understand the gaps in neurosurgical care and improve access to neurosurgery in low-and-middle-income countries (LMICs) over the last decade.

**Methods:** Hierarchical cross-sectional survey administered between October 2022 and March 2023 to participants in 193 countries with population-weighted descriptive statistics and multivariable regression.

**Results:** There were an estimated 72,967 neurosurgeons in the world, including 31,228 in high-income countries (HICs; 2.4 neurosurgeons per 100,000 people), 28,492 in upper-middle income countries (UpMICs; 1.1 per 100,000), 12,381 in lower-middle-income countries (LoMICs; 0.4 per 100,000), and 866 in low-income countries (LICs; 0.1 per 100,000). Africa and Southeast Asia had the lowest density of neurosurgeons (0.1 and 0.3 per 100,000). There were 29 countries with no neurosurgeons, 21 of which were in LMICs (72.4%). From 2016 to 2022, there was an annual increase in the neurosurgery consultant workforce by 10.3% in HICs, 10.7% in UpMICs, 3.8% in LoMICs, and 0.7% in LICs. The WHO region of greatest annual growth was in Southeast Asia (33.4%) while the lowest was Africa (1.8%). In 187 countries from which trainee data were obtained, there were 1,227 neurosurgery training programs with 9,138 trainees. The trainee densities in HICs, UpMICs, LoMICs, and LICs were 0.39, 0.09, 0.06, and 0.07 per 100,000 people, respectively. Trainees in lower-income countries had less exposure to subspecialties, and the largest absolute difference was in functional neurosurgery (46.3% in HICs vs 4.0% in LICs). Neurosurgeons in LMICs were less likely to have access to shunts, endoscopes, microscopes, neuronavigation, angiography, and transfusion.

**Conclusions:** There has been robust growth of neurosurgery in HICs and UpMICs, but growth has lagged in LoMICs and LICs, where the neurosurgery and trainee workforce remains insufficient.



## Education, Ethics, Socioeconomic

Oral presentation

### Analysis of reasons for medical malpractice litigation in open cranial neurosurgery in the United States

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**Objectives:** The present study sought to assess prevalence and characteristics of malpractice claims in cranial neurosurgery.

**Background:** Neurosurgery is the most litigious specialty amongst all specialties across medicine and surgery. Understanding the reasons for malpractice claims can help inform neurosurgeons improve care and mitigate litigation risk.

**Methods:** The Westlaw Edge and LexisNexis databases were searched for cases involving medical malpractice claims due to cranial surgery between the years 1985-2023. Data collected included case date, verdict ruling, jurisdiction, sustained injuries, and awards or settlement amounts.

**Results:** Of 1546 cases reviewed, 317 were identified as malpractice claims resulting from cranial surgery. The primary causes for litigation were delayed or denied treatment (n = 95), perioperative complications (n = 115), inappropriate procedure selection (n = 39), insufficient follow-up care (n = 51), and inadequate informed consent (n = 8). Tumor surgery had the highest number of claims (n = 81), followed by vascular (n = 59), trauma (n = 54), infection (n = 43), functional/epilepsy (n = 28), and other/not defined (n=56). Regarding verdict ruling, 39.43% (n = 125) ruled in favour of the defendant; 20.50% (n =65) in favour of the plaintiff; 2.20% of verdicts resulted in mixed ruling (n = 7); in 10.73% (n = 34) of claims were resolved in an out-of-court settlement; and in 27.13% (n = 86) the verdict was not available. The subspecialty with the highest proportion of plaintiff verdicts was tumor 29.23%, (n = 19), tumor also had the highest proportion of defendant verdicts 26.40%, (n = 33). The average verdict amount awarded to plaintiffs was \$5,592,703, while the average settlement amount was \$2,751,807.

**Conclusions:** The authors highlight several risk factors for medical malpractice claims across cranial neurosurgery. These results suggest that litigation may be mitigated with accurate and timely diagnosis, timely referrals and coordinated care.



## Spine

Oral presentation

### Comparative analysis of posterior lumbar interbody fusion and repeat discectomy for the management of recurrent lumbar disc herniation

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**Objectives:** 1) Compare the postoperative outcomes of posterior lumbar interbody fusion (PLIF) and repeat discectomy for same-level recurrent lumbar disc herniation (RLDH).

2) Analyze the duration of surgery, intraoperative blood loss, and complications rates of PLIF and repeat discectomy.

**Background:** RLDH remains a challenge in spinal surgery. There is no consensus on the best management technique. Most authors recommend repeat discectomy without stabilization, citing the minimal tissue manipulation, lower blood loss, shorter hospitalization, and reduced cost compared to fusion techniques. However, fusion techniques have become popular, with research highlighting the role of instability in disc herniation.

**Methods:** The patients included had previously undergone discectomy and presented with a same-level RLDH. The patients were placed into two groups: 1) discectomy and 2) PLIF. Preoperative and postoperative Oswestry disability index (ODI), duration of surgery, blood loss, duration of hospitalization, and complications were analyzed.

**Results:** The repeat discectomy and fusion groups had 50 and 52 patients, respectively. There was no difference in the duration of hospitalization (3.73 vs. 3.29days p 0.581), operative time (101.25 vs 108.82mins, p 0.48), or intraoperative bloodloss (88.75mL vs 111.47mL p 0.289). The risk of durotomy was 23.4% in PLIF and 38% in repeat discectomy. PLIF had a better postoperative ODI 4.21(0-10) vs 9.27(0-20) (p value of 0.018). The recurrence rate was 26% in repeat discectomy vs 0 in PLIF. Modic-2 changes were present in 84.6% of recurrences. The risk of durotomy was 38% in repeat discectomy and 23.4% in PLIF.

**Conclusions:** Repeat discectomy and PLIF are comparable in terms of blood loss, operation time, and duration of hospitalization. PLIF is superior, with lower rates of durotomy, better long-term pain control, and it eliminates the risk of recurrence. Repeat discectomy has a significant risk of progression to overt instability requiring stabilization and recurrence, especially in the presence of Modic changes on preoperative MRI.

## Paediatric

ePoster presentation

### Cervical tethered cord - not so rare entity

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**Objectives:** Tethering of the cervical spinal cord is a rare entity. The aim of this study is to analyze this author's experience with this rare entity and discuss the clinical, radiological, operative findings and outcome of patients with this condition.

**Background:** Tethering of the spinal cord commonly occurs in the lumbosacral region. Cervical tethered cord is a rare entity and this author's experience with this rare entity is being presented highlighting the potential for misdiagnosis and improper treatment.

**Methods:** All patients treated by this author from 2009- 2019 with tethering elements in the cervical spinal cord were included in this study. All patients underwent routine neurological evaluation, MRI of the whole spine, CT of the spine in selected cases and plain radiographs. The intraoperative findings and clinical presentations were noted. Postoperative complications were recorded. Postoperative MRI scans were done when deemed necessary. Follow up ranged from 6 months to 2 years.

**Results:** All patients treated by this author from 2009- 2019 with tethering elements in the cervical spinal cord were included in this study. All patients underwent routine neurological evaluation, MRI of the whole spine, CT of the spine in selected cases and plain radiographs. The intraoperative findings and clinical presentations were noted. Postoperative complications were recorded. Postoperative MRI scans were done when deemed necessary. Follow up ranged from 6 months to 2 years.

**Conclusions:** Tethering of the spinal cord in the cervical region is rare. The most common causes cervical cord tethering include: limited dorsal myeloschisis, cervical myelocystoceles and cervical dermal sinuses. Early identification of the pathology and appropriate surgical intervention before the advent of severe neurological deficits leads to a good outcome.

## Spine

Oral presentation

### Ossification of the Ligamentum Flavum - unknown facets of the disease

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**Objectives:** : Ossification of the ligamentum flavum (OLF) is a common cause of myelopathy in Asians. The aim of this study is to report this author's experience with 41 cases of OLF.

**Background:** There are several unknown facets of OLF not discussed in the literature. The author proposes to highlight these with his 23 years experience with this entity.

**Methods:** All patients with myelopathy due to OLF treated by this author were included. Neurological status was graded using Nurick's scale and modified JOA score. Whole spine MRI & CT of the spine at the affected levels to look for dural ossification were performed. The excised specimen was submitted for identification of calcium pyrophosphate dihydrate deposition disease (CPPD). Patients were also evaluated for the presence of fluorosis, DISH or other known causes of OLF. Complications were recorded and the postoperative status was assessed. Mean follow up was 20 months.

**Results:** Period of study : 1998 -2020. Lower thoracic region was the most commonly involved site, T9- T12 followed by mid and upper thoracic levels. Three patients had cervical OLF. Associated cervical OPLL was found in 6 patients and one patient had spinal syringomyelia induced by OLF. The cause of OLF could be identified in 22 patients: 13 had CPPD, 3 had fluorosis; 4 had DISH, 1 had myositis ossificans progressiva and 1 had renal rickets. Dural ossification was found in 13 (32%) of patients. Thirty nine patients underwent surgery. One patient each with renal rickets and myositis ossificans progressiva did not undergo surgery. Dural ossification was associated with increased risk of dural lacerations and CSF leaks. Postoperative deterioration was encountered in 3 patients.

**Conclusions:** OLF is an under recognized cause of thoracic myelopathy. The aetiology of this entity can be identified in the majority of the patients. Dural ossification is associated with increased postoperative morbidity.

## Skull Base

ePoster presentation

### Variations of Chiari I malformations

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**Objectives:** In patients with Chiari I malformation, the cerebellar tonsils (and only the cerebellar tonsils) herniate into the spinal canal. A herniation of more than 5 mm caudal to the level of the foramen magnum is generally assumed, although some authors also accept less than 5 mm. The average tonsil depth is 11 mm.

**Background:** For a long time it was assumed that patients with Chiari I malformation were a uniform group of patients. All patients with Chiari I malformation received the same standardized surgery if surgery was indicated. But surgery sometimes failed with fatal results. Why did this happen?

**Methods:** The clinical history of over 400 patients with Chiari I malformation, which were treated in our hospital from 2000 to 2023, were evaluated.

**Results:** According to just very few literature references however five subgroups with different factor of origin could be defined: (a) too narrow posterior fossa, (b) tethered cord syndrome, (c) instability of the atlanto-occipital and atlantoaxial joint, (d) increased intracranial pressure and (e) decreased intraspinal pressure.

**Conclusions:** Each of these subgroups requires a specific, sometimes contradictory therapy, thereof it is extremely important to clearly define the cause of the Chiari I malformation before deciding on the next step of therapy.

## Global Neurosurgery

ePoster presentation

Neurosurgery English Spanish translation: application for global neurosurgery collaboration

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**Objectives:** To innovate an accessible, high-quality application for neurosurgical translation to aid in global neurosurgery efforts and improve access to the latest English-language literature.

**Background:** Many global neurosurgery efforts involving collaborations between high resource and low resource settings face a language barrier in both clinical work and educational programming. Bilingual physicians involved in global neurosurgical efforts are scarce, and interpreters must be well versed in neurosurgical terms. Simultaneously, much of the neurosurgical literature remains in English. To aid in cross-cultural collaborations and increase access to English-language literature, neurosurgery-specific translation resources are warranted.

**Methods:** Using the C# programming language (Version 12.0), we constructed the Neurosurgery English Spanish Translation (NEST) web application. All data is retrieved and stored in a Google Sheet with real-time updates, encouraging collaboration from bilingual clinicians to add relevant neurosurgical terminology and improve accessibility. A search-bar is available on the top-left of the interface, allowing users to obtain the English-Spanish counterpart of a specific neurosurgical term and abbreviation. The application is available for both desktop and mobile access.

**Results:**

NEST encompasses a catalog of >350 neurosurgical terms listed under the following categories: anatomy, diagnoses, procedures, critical care, medications, imaging, symptoms & examination, and surgical techniques. It has been piloted in vascular neurosurgical efforts in Paraguay and found to be accurate and user-friendly.

**Conclusions:** NEST is a free, online English-Spanish translation resource that can be used in global health settings and within academia to enhance bilingual communication between providers. This platform can be expanded to accommodate additional languages and a growing repository of neurosurgical terms.

## Oncology

ePoster presentation

### Intraoperative subcortical mapping of the corticospinal tracts in gliomas resection: bipolar vs monopolar stimulation thresholds

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**Objectives:** This clinical study describes our experience with monopolar and bipolar SCS thresholds and intra- and post-operative outcomes in glioma surgery.

**Background:** Intraoperative direct-electrical stimulation is considered the gold-standard for brain mapping in order to maximize safe gliomas' resection and minimize neurological sequelae. Currently, mapping of the CST lacks standardization of stimulation parameters and methods.

**Methods:** In this prospective study, 11 patients underwent glioma resection with motor mapping through continues monopolar train-pulse stimulation. Patients who demonstrated motor responses were stimulated with a bipolar probe at the exact location. The stimulation location was registered with the navigation system (and correlated with the DTI CST).

**Results:** The most common preoperative presentation included seizure (n=5) motor weakness (n=4) and dysesthesia (n=3). The pathology showed high-grade gliomas in 8 and low-grade gliomas in 3 patients. Comparison of monopolar and bipolar SCS was reliably performed in 13 subcortical points, at the same proximity to the CST. Subcortical bipolar stimulation demonstrated higher thresholds in 11 points compared to monopolar [average delta of 6mA (range: 1-11mA)]. In the remaining two points, one showed higher thresholds for the monopolar SCS, and the other showed similar thresholds for both methods. No patient experienced intraoperative seizures. Transient new postoperative motor deficits were observed in 3 patients and postoperative seizures occurred in 2. There were no new permanent motor deficits. Gross-total resection was achieved in 2 patients, subtotal in 5 patients, and near-total in the rest, according to the proximity to the CST.

**Conclusions:** Bipolar SCS demonstrates higher thresholds than conventional monopolar SCS in CST mapping. There were no intraoperative seizures and no post-operative permanent new motor deficit in our cohort. Combining monopolar and bipolar SCS may lead to better surgical results without compromising patient safety. We are conducting a prospective evaluation in a larger cohort to verify our results.

## Paediatric

Oral presentation

### Rare anomalies of the craniovertebral junction - lessons learned

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**Objectives:** The aim of this presentation is to discuss the clinical, radiological, surgical findings and management of Proatlal Segmentation Anomalies of the Craniovertebral Junction.

**Background:** Proatlal segmentation anomalies are due to defective resegmentation of the fourth occipital sclerotome. They have diverse clinical, radiological and surgical findings and their management varies according to the pathological anatomy.

**Methods:** Between Jan 2012 and June 2016, nine patients with PSA were encountered. Plain radiographs, thin section CT & MRI were obtained for evaluation. Surgical management varied according to the nature of the underlying pathology.

**Results:** Four patients had cervical myelopathy. One had myelopathy with cerebellar signs, three had only neck pain & vertigo and in one patient the diagnosis was made during radiological examination after trauma. Radiologically, one patient had assimilation of anterior arch of atlas, platybasia, partial assimilation of posterior arch, basilar invagination and an accessory ossicle behind the flat clivus. The second patient had a pre-basioccipital arch, basilar invagination, completely assimilated atlas, unilateral occipital condyle hypoplasia and Klippel-Feil anomaly. The third patient had Os Avis or dystopic os odontoideum. The fourth patient had pre-basioccipital arch and atlanto-axial subluxation. The fifth patient had severe platybasia, retroflexed odontoid compressing the cervicomedullary junction, tonsillar ectopia up to C 2 and cervical syrinx; patients six and seven had retroflexed odontoid with lateral proatlal failure, patients eight and nine had prebasioccipital arch. Six of the nine patients underwent surgery. Three patients underwent craniovertebral realignment and occipitocervical fusion. Two patients underwent Goel-Harms fusion and one patient underwent Goel-Harms fusion with distraction using spacers in the atlantoaxial joint and foramen magnum decompression.

**Conclusions:** PSA is a rare cause of CVJ compression and/or instability. The management of PSA is aimed at: 1. Decompressing the cervicomedullary junction if there is compression and, 2. Stabilization of the craniovertebral junction, if there is instability.

## Neurovascular Surgery

Oral presentation

Brainstem cavernomas: anatomical, clinical and surgical considerations from 27 cases

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**Objectives:** Share our departmental experience in surgery of brainstem cavernomas.

Review, anatomical and microsurgical considerations, in surgical planning and prediction of possible surgical complications. Reinforce the importance of intraoperative monitoring.

**Background:** Brainstem cavernomas are benign lesions that, due to their location, pose significant challenges in therapeutic orientation, and surgery, given their location. We aim, to present our ten-year case serie.

**Methods:** We reviewed 27 patients, with brainstem cavernomas operated on in our Neurosurgery Department from 2013 to 2022. Patients were distributed according to their location and the pial access to the lesion, which is essential for planning the surgical access. Surgical treatment has been proposed in patients with symptomatic haemorrhage, associated with neurological deficit and with adequate surgical access. In all patients, surgery was performed with intraoperative neuronavigation and neurophysiological monitoring. Since 2017, tractography (DTI) for surgical planning has been systematically acquired and analyzed. Essential and individual anatomical aspects for the choice in surgical strategy are described.

**Results:** No mortality occurred in our case series. In the neurological evaluation during hospitalization, 7 patients (25,9%) improved, 16 (59,3%) maintained the same condition and 4 (14,8%) worsened their symptoms. In the evaluation at 6 months postoperatively, 18 (66,7%) improved, 7 (25,9%) maintained the same state and 2 (7,4%) display a worsened condition.

**Conclusions:** Despite the risk associated with the surgery, the majority of patients had a favourable postoperative outcome and although some patients had new neurological deficits (most of which were transient) most patients improved neurological deficits.

The surgical approach varies according to the location. Anatomical and microsurgical knowledge, tractography, neuronavigation and intraoperative neurophysiological monitoring contribute to satisfactory surgical results.



## Neurovascular Surgery

ePoster presentation

Cirroid aneurysms (Scalp AVMs): anatomical, clinical and surgical considerations in 5 cases. Experience in a Portuguese department

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**Objectives:** We present our center's experience in cirroid aneurysms. To discuss a rare pathology.

**Background:** Cirroid aneurysms are relatively rare arteriovenous malformations of the scalp. The usual presentation is a pulsating mass on the scalp with or without headache, local discomfort, or tinnitus. This and the risk of bleeding with skin damage are indications for treatment. The natural history of this disease is not well known.

**Methods:** We reviewed five patients with cirroid aneurysms (four women and one man), 4 operated and 1 non-operated. All patients underwent magnetic resonance imaging and digital subtraction angiography, presenting with bilateral nutrition.

Surgical treatment was proposed in all patients, but one patient refused because she became asymptomatic during follow-up. Before surgery two of the patients underwent previous multiple endovascular embolizations, with no permanent success.

We made a curved incision, excluding contralateral nutrition, preserving the pericranium and epidermis, except in 1 patient.

Essential and individual anatomical aspects in the choice of surgical strategy should be considered.

**Results:** The risks of surgery are blood loss, thinning skin that may have trouble healing, hair loss and infection. No mortality occurred in our case series. In addition, all operated patients improved with the disappearance of the pulsatile mass and postoperative control exams showed the resolution of these rare AVMs. There were no skin-related or aesthetic complications in the clinical follow-up.

The patient who refused surgery maintains a stable swelling without other symptoms.

**Conclusions:** Treatment of the cirroid aneurysm is difficult due to the vascular anastomotic network of the scalp and the cosmetic disfigurement that may occur even after the intervention.

Multiple arterial feeders are one of the main reasons for the failure of total obliteration with endovascular treatments. In our experience, surgical excision of scalp cirroid aneurysms seems to be the most effective treatment to ensure low recurrence rates.

## Paediatric

Oral presentation

Pediatric brain tumors: clinical and molecular characterization with special emphasis on *H3F3A* gene in Sudanese patients

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**Objectives:** The study aims to clinically and molecularly characterize pediatric brain tumors in Sudanese patients with special emphasis on *H3F3A* gene.

**Background:** Pediatric brain tumors are the second neoplasm in children following Leukemia. High-grade gliomas are the most with mutations in *H3F3A*, *ATRX*, and *DAXX* genes. The importance of studying those mutations is of diagnostic, prognostic, predictive, and therapeutic values.

**Methods:** A cross-sectional study was conducted at the National Center for Neurological Sciences in Khartoum in Sudan, from July 2017 to August 2018, involving all patients <19 years diagnosed with brain tumors. With ethical approval, tissue samples were collected from 31 operated patients, and processed for DNA extraction, followed by PCR to detect the *H3F3A* gene. PCR product analysis was processed using sequencing for five samples done abroad. Mutations analysis was done using BMC, and data using SPSS software.

**Results:** Of the 34 patients, males were dominating in 58.8%, the most affected age group was 1-6 years, most patients were Afro-Asiatic with most of the parents showing positive consanguinity, headache was the commonest symptom, gliomas were the most histopathological type in 67.6%, surgery was done in 91.2% with adjuvant radiotherapy, and the mortality rate was 44.1%. The most detected mutations were frameshift mutations R18Gfs\*19, K19Sfs\*18, (K15Tfs\*35), K15E, and K15I with a functional impact.

**Conclusions:** The study is establishing genetic screening among pediatric brain tumors in Sudan, with new and varying functional mutations of *H3F3A* gene detected. With a recommendation of increasing the sample size, the study is promising to help decrease the mortality rate and improve the quality of life of pediatric patients with brain tumors.

## Spine

Oral presentation

### Cervical spinal canal stenosis: a comparison of incidence and severity between the population of Curaçao and literature

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**Objectives:** To assess the incidence and severity of CSCS, based on morphologic parameters of the spinal canal and spinal cord, in the population of Curaçao compared to literature. In addition, the prevalence of ossification of the posterior longitudinal and flavum ligaments (OPLL/OLF) was calculated and compared to literature.

**Background:** Degenerative spine conditions are the most common cause of spinal cord injury in the elderly population and comprises, degenerative disc disease, cervical spondylotic myelopathy (CSM), ossification, and hypertrophy of the spinal ligaments, which may result in cervical spinal stenosis.

**Methods:** Retrospective descriptive study analyzing data gathered from patients with known symptomatic CSCS as confirmed on MRI scans, from 01-2017 until 12-2020. The antero-posterior diameter, cross-sectional surface area of the spinal canal, spinal cord and dural sac were measured at mid-vertebral and intervertebral disc level on MRI scans. The degree of OPLL and OLF were assessed on CT scans. Additionally, the annual incidence of CSCS was calculated.

**Results:** 278 patients (155 males) were recruited. The annual incidence of CSCS was 55.9/100 000 people, which is 13-fold higher compared to literature findings. In men and women, the narrowest spinal canal was at C4-C5 with a mean diameter of 8.2mm and 8.5mm, respectively. The mean diameter at non-stenotic levels was 12.9mm at mid-vertebral level and 11.8mm at disc level, being consistently lower than the internationally accepted 13mm threshold defining normality versus stenosis. The prevalence of OPLL and OLF was 4.7%(n=13) and 2.5%(n=7), respectively, which is comparable with reports from Asia, but higher compared to USA cohorts.

**Conclusions:** The annual incidence of CSCS in the population of Curaçao was substantially higher compared to reports from North America and Western Europe. Remarkably, the diameter at non-stenotic cervical levels were consistently below 13mm, and the prevalence of OPLL/OLF were similar to Asians, but higher compared to Caucasians.

## Oncology

Oral presentation

Technical nuances and long-term results of endovascular venous stenting to control venous hypertension from meningiomas invading intracranial venous sinuses

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**Objectives:** Aim to evaluate control of venous hypertension by endovascular venous sinus stenting and their long-term patency.

**Background:** Meningiomas with intra-sinus invasion may result in venous hypertension and papilloedema. Sinus resection and graft reconstructions carry significant morbidity especially for posterior superior sagittal sinus (SSS) or dominant transverse sinus (TS).

**Methods:** Retrospective review of endovascular venous sinus stenting for meningiomas associated with venous sinus compromise over 17 years (2004 – 2021). Workup and technique will be fully described.

**Results:** Sixteen cases, 12 females and four males aged 24 – 84 years, were analysed. Measurable tumour mass in six cases, whereas remaining were en plaque or localised/concentric enhancement around sinus wall. Most common presentations were headaches in all and papilloedema in nine (56%).

At first procedure, stents inserted in SSS (10), extended from SSS to TS (1), within TS (4) and torcula (1). However, other additional sites of sinus narrowing not involved by tumours were identified mainly in downstream TS or jugular. In five, these sites were stented as well. There was a mean drop of 18 mmH<sub>2</sub>O in venous pressure gradient and 11 mmH<sub>2</sub>O in CSF pressures. Initially papilloedema resolved in 80% and headaches in 55%.

Follow-up period: 4m – 18y years (median eight years). Nine (56%) required further stenting for recurrent or persistent venous narrowing. Four had late stenting for stenosed sites not involved by meningioma.

In long-term, papilloedema resolved in all cases and six (40%) had no symptoms at all. Headaches of variable degrees persisted in others despite repeated intervention.

No complications in 37 procedures. No occluded stents at latest imaging with one minor narrowing and one awaiting further stenting.

**Conclusions:** For selected patients with invading meningiomas and symptomatic compromise of venous outflow, endovascular stenting resulted in good clinical outcome. Preservation of visual function was universal. Some required multiple subsequent endovascular interventions. Long-term follow up is advised.

## Oncology

Oral presentation

### Enhancing the pre-operative prediction of supraleisional ablation in laser interstitial thermal therapy (LITT) for brain tumors using machine learning

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**Objectives:** To use machine learning (ML) to optimize the pre-operative prediction for supraleisional ablation.

**Background:** The extent of ablation (EOA) following laser interstitial thermal therapy (LITT) is a strong prognostic factor for improved survival and local control in patients with brain tumors. Maximizing the EOA can lead to the best outcomes; however, the pre-operative factors that predict a supraleisional ablation (EOA > 100%) remain unclear.

**Methods:** A retrospective study of patients with glioblastoma, metastasis, or radiation necrosis receiving LITT between 2013 to 2023. Several clinical and radiographic pre-operative factors were evaluated. Five ML models, Decision Trees, Random Forest, Gradient Boosting, XGBoost, and AdaBoost, were trained, optimized, and validated using an 80/20 training/testing split and 5-fold cross validation. The area under the receiver operating characteristic curve (AUC-ROC) was used as the primary metric to evaluate model performance. The optimal pre-operative volume cutoff for establishing an EOA > 100% was also investigated.

**Results:** 201 patients were included in the final cohort. Multivariate logistic regression showed that lower pre-operative volume ( $p < 0.001$ ) and deep-seated lesions ( $p = 0.041$ ) have a greater likelihood to undergo a supraleisional ablation. Of the five ML models analyzed, XGBoost had the highest AUC-ROC of 0.74. Pre-operative factors of highest importance were pre-operative volume, deep-seated lesions, and ellipsoid ratio. A subsequent ROC analysis was conducted to determine the optimal threshold for establishing a pre-operative volume cutoff for achieving an EOA > 100%. This cutoff was 4.38cc.

**Conclusions:** This study shows the improved predictive ability of ML to optimize pre-operative prediction for a supraleisional ablation of brain tumors following LITT. Lesions less than 4.38cc were the most likely to receive a supraleisional ablation, thus potentially guiding and optimizing treatment decisions in surgical neuro-oncology.

## Oncology

Oral presentation

### Enhancing patient selection for same day discharge following craniotomy for brain tumor resection: a prognostic scoring system

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**Objectives:** To quantitatively assess the selection criteria for same day discharge (SDD) of patients undergoing brain tumor resection to develop a clinical scoring system for patient selection.

**Background:** Neurosurgery, like other surgical fields, is undergoing a transformation in patient management with the increasing popularity and feasibility of enhanced recovery and same day discharge protocols. While these protocols reduce the risk of hospital-acquired complications and improve patient satisfaction, the appropriate selection of patients remains a topic of debate.

**Methods:** Firstly, clinical data of patients selected for SDD was prospectively collected from August 2021 to August 2022. Simultaneously, a retrospective analysis was conducted on patients who met the criteria for SDD but were excluded based on the surgeon's clinical judgment during the same period. Additionally, a comparative analysis was performed, comparing the pilot and follow-up studies to derive a clinical scoring system for patient selection.

**Results:** Throughout the study duration, 31 out of 334 patients were chosen for SDD, while 59 patients met the predetermined criteria but were not selected based on the surgeon's discretion. There were no significant differences in outcomes between the two groups, and no post-operative complications were observed within 30 days of surgery in the SDD group. Several preoperative clinical characteristics were found to be significantly different between the cohorts, including left-sided lesion, extra-axial pathology, prior treatment of brain tumor, and tumor volume < 11.75 cm<sup>3</sup>. These variables were incorporated into a predictive scoring system for successful SDD, which demonstrated significant accuracy when applied to the mixed prospective cohort.

**Conclusions:** This study presents a straightforward clinical scoring system that aids in the appropriate selection of candidates for SDD after craniotomy for brain tumor resection. The implementation of this clinical tool aims to assist clinicians in choosing the optimal admission course and contributes to the growing literature on same-day and outpatient cranial neurosurgery.

## Spine

ePoster presentation

### The utility of artificial reality in the digital age of spine surgery: current technological feats and future directions

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**Objectives:** Our study examines the current literature on AR-assisted MISS, synthesizes findings, and creates a narrative highlighting the history and future of AR in spine surgery.

**Background:** Spine surgery has undergone significant changes in approach and technique. With the adoption of intraoperative navigation, minimally invasive spinal surgery (MISS) has arguably become the gold standard. Augmented reality (AR) has now emerged as a front-runner in anatomical visualization and narrower operative corridors. In effect, AR is poised to revolutionize surgical training and operative outcomes.

**Methods:** We utilized clinical trials, technical reviews, and the latest case series to outline recent advances in the use of AR for MISS.

**Results:** Integration of AR in surgery began with the development of a head-up display (HUD) system that superimposed computerized tomography (CT) image data on the eyepiece of an operating microscope in 1986. The HUD system enabled visualization of operative margins during brain tumor resection. However, it became apparent that screen and microscope focused displays were limited by their attention shift and line-of sight interruption. To overcome this, head-mounted displays (HMDs) were developed. One such HMD guided needle insertion during percutaneous vertebroplasty in 2013. Another was recently FDA approved for pedicle screw placement in 2021. Neurosurgeons at Johns Hopkins conducted the first in-human AR-HMD assisted surgery in which six pedicle screws were placed in an L4-S1 decompression. Later, HoloLens was used by Lieu et al. in lumbar pedicle screw placement to achieve 94% accuracy in phantom models, and Charles reported at 94% pedicle screw placement accuracy in 20 TLIF procedures performed using AR.

**Conclusions:** We anticipate that AR can have a synergistic, complementary effect on MISS similar to spinal robotics.

## Skull Base

ePoster presentation

Tumor control and hearing preservation rates in patients undergoing CyberKnife stereotactic radiotherapy for treatment of vestibular schwannoma: meta-analysis

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**Objectives:** In the present study, we systematically review the extant literature describing CyberKnife radiosurgery (CKRS) as treatment for vestibular schwannoma (VS). We then perform pooled meta-analysis of long-term tumor control and hearing preservation rates reported across all retrospective observational series describing the efficacy of CKRS.

**Background:** Vestibular schwannomas (VS), which most commonly arise from the Schwann cells at the porus acusticus of the inferior vestibular component of cranial nerve (CN) VIII, represent the third most common primary intracranial neoplasm (8%) and account for approximately 80% of cerebellopontine angle (CPA) tumors.

**Methods:** We queried the PubMed, Scopus, and Web of Science databases to identify all primary prospective or retrospective studies reporting local tumor control and hearing preservation rates following CKRS for treatment of vestibular schwannoma. All studies returned across the three databases were subject to a systematic screen according to pre-defined inclusion and exclusion criteria in a multi-step process performed by two investigators.

**Results:** Following a comprehensive, systematic literature search, a total of 15 studies comprising 2018 vestibular schwannoma patients were included. Pooled rate of tumor control using the random effects model was 96% (95% CI: 95%-98%), and that of hearing preservation was 73% (95% CI:66%-81%). The most common major complications following CKRS were trigeminal neuralgia, facial neuropathy, and hydrocephalus.

**Conclusions:** As studies on CyberKnife radiosurgery, one of the SRS modalities administered via LINAC, are far less common than studies on Gamma Knife radiosurgery for treatment of VS, more studies are needed in order to validate the findings reported in the present meta-analysis. Although there are currently only 15 single-institution retrospective studies available in the neurosurgical literature, this study provides the most comprehensive and up-to-date analysis of the most relevant outcomes of interest in treatment of vestibular schwannoma with stereotactic radiotherapy.



## Peripheral

ePoster presentation

### Cranial nerve regeneration mediated by adipose tissue derived stem cell lines

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**Objectives:** Within the context of modern treatment paradigms for peripheral nerve injuries, we sought to investigate the role of adipose-derived stem cells (ADSCs) in the regeneration of cranial nerves.

**Background:** Large peripheral nerve injuries may require surgical reconnection. Cell-based therapies have also been investigated for nerve regeneration.

**Methods:** PubMed and Embase databases were used to search for primary studies reporting the use ADSCs in the regeneration of cranial nerves. A total of 12 studies were included which all presented data on specific neural injury, therapy, and functional outcomes.

**Results:** Eight studies focused on the facial nerve (66.7%), two on the optic nerve (16.7%), one on the olfactory nerve (8.3%), and one on the hypoglossal nerve (8.3%). One study applied ADSCs to human cranial nerve injuries, while the remainder studied animal models. In these studies, ADSC groups had higher numbers of myelinated fibers, increased myelin thickness and diameter of muscle fibers as well as greater magnitude of compound muscle action potentials (CMAP) when compared to controls. In studies focused on optic nerve regeneration, significant improvements across visual tests were observed.

**Conclusions:** ADSCs demonstrate potential utility in regard to their ability to facilitate functional recovery of cranial nerves in humans as well as animal models. As such, this therapy merits further investigation so that its true clinical.

## Skull Base

ePoster presentation

### Maximal safe resection of challenging petroclival meningiomas: a systematic review of multi-stage approaches selection achieving considerations

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**Objectives:** To understand why skull base surgeons plan multi-stage resection of petroclival meningiomas.

**Background:** Petroclival meningiomas are among the most formidable and technically challenging tumors in skull base surgery owing to their deep-seated location and proximity to critical neurovascular structures. Selection of surgical approach should be tailored to each individual patient and dependent upon the particular location and extension of the tumor and adjoining neurovascular structures, as well as patient hearing status on audiological evaluation. To complement to the variety of approaches that exist for petroclival meningioma resection, a strategy that has previously been described involves separating the procedure into two or more “stages”.

**Methods:** Three databases were queried according to stated objective.

**Results:** Fourteen studies describing 187 patients (59.3% female, age range: 5 – 81 years) met criteria for inclusion. The most common presenting symptom at diagnosis was headache (24.6%). Other common symptoms included cerebellar signs (16.0%) and gait disturbances (13.4%). Petroclival meningiomas were most commonly observed extending to the cavernous sinus (52.88%) and Meckel’s cave (49.04%). With respect to critical neurovasculature, the trigeminal nerve was involved in a majority (54.59%) of petroclival meningiomas, while other relevant cranial nerves with tumor involvement included CNVII (16.22%) and CNVIII (12.43%). Additionally, the most commonly involve vascular structures were the basilar (2.16%) and superior cerebellar arteries (1.62%). 144 (77%) patients underwent surgery involving a single stage, while 43 (23%) underwent surgery in which a two-stage approach was used. The most common single-stage approaches were the retrosigmoid (n = 35) and transpetrosal (n = 22) and multi-stage approaches most commonly involved the subtemporal (n=6), pterional (n=5), and suboccipital (n=4) approaches.

**Conclusions:** Indications for multi-stage surgery include coexistence of lesion in both middle and posterior skull base compartments, absence of meaningful hearing function, tumor size, and surgeon preference.

## Spine

ePoster presentation

### Hydroxyapatite crystal deposition disease with multiple joint involvement resulting in severe lumbar spinal canal stenosis: a case report

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**Objectives:** To describe a rare complication of hydroxyapatite (HA) crystal deposition disease (HADD) – spinal canal stenosis. To discuss clinical features and surgical management of this entity.

**Background:** HADD is a crystal-induced arthropathy caused by para-articular and/or intra-articular deposition of HA crystals. Etiology is uncertain, predisposing factors include microtrauma, local ischemia, end-stage renal disease. Commonly, glenohumeral joint is affected, less often - elbow, wrist, hand, hip, knee, ankle, foot and spine. Rarely – deposition of crystals is associated with spinal canal stenosis.

**Methods:** We report a case of 34-year-old male who was admitted to the hospital with recurrent fever and elevated inflammatory markers for the past few months. Patient had a history of stage 5 chronic kidney disease treated with hemodialysis, anabolic-androgenic steroid use, arterial hypertension, tertiary hyperparathyroidism and multiple calcium deposits along glenohumeral, iliofemoral joints bilaterally, left foot and lumbar spine. Computed-tomography showed hyperdense calcifications in soft tissue along lumbar spine with minimal intraspinal involvement. Over the course of a few weeks symptoms worsened, the patient presented with lower back pain radiating in both legs, progressive lower paraparesis, walking difficulties. Magnetic-resonance imaging showed hypointense periarticular lesions with fluid levels on both T1 and T2-weighted images from L1 to L3 extending intraspinally with severe spinal canal stenosis, medullary cone compression. Surgical resection of the pathological tissue was indicated.

**Results:** The patient underwent L1-L3 laminectomy and resection of the lumbar soft tissue and intraspinal extradural calcified depositions. Histopathological examination confirmed diagnosis of HADD associated spinal canal stenosis. Physical rehabilitation followed, progressive recovery was seen, with almost complete resolution of motor deficits 6 months post surgery.

**Conclusions:** HADD, affecting lumbar spine, can lead to inflammation, swelling and stenosis of the spinal canal resulting in severe back pain and progressive neurological deficits. Surgical treatment in such cases can be curative and lead to good outcomes.

## Endovascular Neurosurgery

ePoster presentation

Endoscope-assisted endonasal transsphenoidal puncture of the cavernous sinus for embolization of cavernous dural arteriovenous fistula that fail traditional endovascular access

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**Objectives:** To report a novel method to access cavernous in selected cases.

**Background:** Endovascular embolization is the preferred treatment for cavernous dAVF, but failure to catheterize the cavernous sinus may occur as a result of tortuosity, hypoplasia, or stenosis of the normal venous routes. Direct puncture of the cavernous offers an alternative approach.

**Methods:** This 63-year-old lady presented with severe chemosis and proptosis of the both eyes. Digital subtraction angiography revealed a dAVF with feeding arteries arising from bilateral internal maxillary arteries. there were no patent sinuses or venous plexuses connecting to the fistula. An endoscope-assisted transsphenoidal puncture created direct access to the nidus for embolization.

**Results:** complete embolization was achieved without recanalization during one-year follow-up angiography.

**Conclusions:** Endoscope-assisted transsphenoidal puncture of the cavernous sinus is a feasible alternative to treat difficult-to-access dAVFs in a neurosurgical hybrid operating suite.

## Spine

Oral presentation

Administration effect of nasal ACTH4-10PRO8-GLY9-Pro10 on the expression of Malondialdehyde and F2-isoprostane in sprague dawley rat spinal cord injury model

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**Objectives:** To determine the administration effect of ACTH4-10 could lower the level of reactive oxygen species (ROS), such as Malondialdehyde and F2-isoprostane in acute spinal cord injury.

**Background:** Acute spinal cord injury (ASCI) could produce high morbidity since its causing the cell death through apoptosis. Reactive oxygen species (ROS), such as Malondialdehyde and F2-isoprostane could determine the level of apoptosis. ACTH4-10Pro8-Gly9-Pro10 is a peptide group known as antioxidant is believed to inhibit the apoptosis process and increasing the regeneration of the cells.

**Methods:** This study was a true experimental laboratory study. Mild and severe compression of the spinal cord was performed on 27 subjects respectively with 3 group of samples with control included, divided in 3 and 6 hours after the injury. All subjects were then terminated, and spinal cord tissue was taken to determine MDA and F2-isoprostane expression under the microscope, which control samples compared with samples with distribution of ACTH4-10Pro8-Gly9-Pro10.

**Results:** In 3- and 6-hours-mild ASCI that ACTH4-10Pro8-Gly9-Pro10 is given, MDA expression were lower ( $8,40 \pm 1,94$  and  $8,60 \pm 1,67$ ) compared with control ( $12,60 \pm 2,6$  and  $14,40 \pm 1,81$ ) and severe ASCI that ACTH4-10Pro8-Gly9-Pro10 is given, consistent with the mild, we observed that MDA expression were lower ( $9,8 \pm 2,16$  and  $12,2 \pm 1,92$ ) compared with control ( $16,2 \pm 2,16$  and  $16,40 \pm 2,07$ ). For the F2-isoprostane expression, the result was constant with MDA, we observe lower expression of F2-isoprostane both in mild (control:  $12,8 \pm 3,03$  and  $13,8 \pm 2,58$ ) compared to ACTH given ( $5,0 \pm 2,0$  and  $7,6 \pm 1,34$ ) and severe (control:  $15,4 \pm 2,60$  and  $16,4 \pm 2,30$ ) compared to ACTH given ( $8,0 \pm 2,23$  and  $11,8 \pm 1,64$ .) 3- and 6-hours after the injury.

**Conclusions:** Administration of ACTH4-10Pro8-Gly9-Pro10 could decrease MDA and F2 isoprostane expression, thus, it might have a potential to become an adjuvant therapy for spinal cord injury in order to prevent further secondary injury.

## Education, Ethics, Socioeconomic

Oral presentation

High-definition 4K 3D exoscope in spine surgery: a single center experience with 102 cases

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**Objectives:** To evaluate the advantages and limits of using high-definition 4K 3D exoscopes in spinal neurosurgery.

**Background:** Binocular optical microscopy (OM) paved the way to modern neurosurgery. However, OM present some intrinsic limitations such as steric hindrance that can lead to surgeon discomfort. In addition to that certain models don't offer the same vision quality to the assistant eyepiece especially in terms of resolution and stereopsis. To overcome these limits new operative tools were recently introduced, among them exoscopes.

**Methods:** In the period between February 2022 and April 2023 we progressively implemented the use of the high definition 4K-3D exoscope in patients undergoing spinal surgery. During all the surgeries a standard binocular optical microscopy (OM) was available in the OR.

**Results:** A total of 102 procedures were performed: 32 cervical spine surgeries, 20 dorsal spine surgeries and 50 lumbosacral spine surgeries comprising degenerative diseases, malformations, tumours (both intradural and extradural), dural arteriovenous fistulas (dAVF), intramedullary cysts, vertebral fractures. In none of the cases a switch to "standard operative microscopy" was deemed necessary. None of the surgeons found difficult to switch from OM to exoscope. Both the first and second operator described better postural comfort within the surgery with respect to the standard OM in all cases and the assistants reported an excellent intra-operative vision that was superior to the standard OM. During the procedures the 55" inch 4K-3D monitor provided a very useful tool for the surgeon to better explain anatomic details and surgical steps to residents and students present in the OR.

**Conclusions:** High-Definition 4K-3D exoscopes represent an excellent alternative to standard binocular operative microscopy (OM) in spine surgery. They overcome the problems of ergonomic positions and surgeons' posture linked to the standard OM, provide a better vision to the assistant and can be a precious tool in residents and student teaching.

## Trauma

Oral presentation

Resting State Networks in patients with acute disorders of consciousness after severe traumatic brain injury

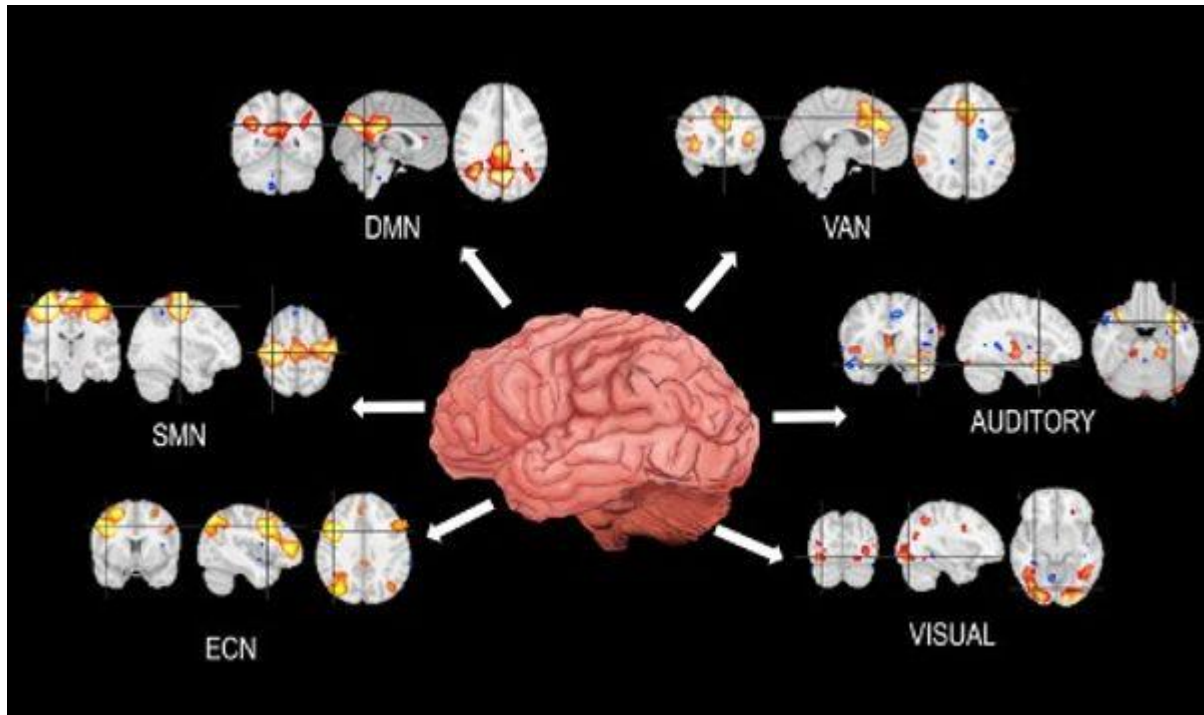
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**Objectives:** This study aims to describe resting state networks (RSN) in patients with disorders of consciousness (DOCs) after acute severe traumatic brain injury (TBI) and identify the different patterns of activation.

**Background:** The brain activity recorded during the resting state has been explored for analyzing the underlying pathophysiology of DOCs. Figure 1. Resting state networks.



**Methods:** Adult patients with TBI with a GCS score <8 who remained in a coma, minimally conscious state (MCS), or unresponsive wakefulness syndrome (UWS), between 2017 and 2020 were included. Blood-oxygen-level dependent imaging and independent component analysis were performed to compare their RSN with 10 healthy volunteers.

**Results:** Of a total of 293 patients evaluated, only 13 patients were included according to inclusion criteria: 7 in coma (54%), 2 in MCS (15%), and 4 (31%) had a UWS. RSN analysis showed that the default mode network (DMN) was present and symmetric in 6 patients (46%), absent in 1 (8%), and asymmetric in 6 patients (46%). The executive control network (ECN) was present in all patients but was asymmetric in 3 (23%). The right ECN was absent in 2 patients (15%) and the left ECN in 1 (7%). The medial visual network was present in 11 (85%) patients and absent in 2 (15%). Finally, the cerebellar network was symmetric in 8 patients (62%), asymmetric in 1 (8%), and absent in 4 (30%). In the control group, the following networks were found in all subjects: the DMN, the right ECN, the medial visual network, and the cerebellar network.

**Conclusions:** Substantial impairment in activation of RSN is demonstrated in patients with DOC after severe TBI in comparison with healthy subjects. Three patterns of activation were found: normal/complete activation, 2) asymmetric activation or partially absent, and 3) absent activation.



## Oncology

ePoster presentation

Endoscopic resection of a third ventricle Rosette-Forming Glioneuronal Tumor (RGNT): a very rare case

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**Objectives:** To report a very rare lesion, never described exclusively in the anterior portion of the third ventricle, presenting a video with surgical nuances, and to discuss associated complications.

**Background:** A 44-year-old female with no relevant past history, presented with several days of headache and lethargy. Head CT scan and MRI showed a lesion located in the anterior portion of third ventricle measuring 26x18x10mm, with concomitant acute obstructing hydrocephalus. The lesion was well circumscribed, T1-weighted hypointense and T2-weighted hyperintense with solid and cystic components.

**Methods:** Patient underwent endoscopic total resection of the lesion, along with third ventriculostomy. A short video describes the technique. There were no intra-operative complications.

**Results:** Histology revealed a rosette-forming glioneuronal tumor (RGNT). Two days after surgery the patient had an absence seizure. Control MRI showed no signs of hydrocephalus, hemorrhage or other complications. Three days after being discharged she returned to the hospital with an episode of generalized seizure, CT scan showed no complications but "cerebral salt wasting" with severe hyponatremia was identified and treated. The patient is asymptomatic in two-years follow-up with no recurrence.

**Conclusions:** RGNT is a rare, low-grade tumor and should be considered in differential diagnosis of lesions in the anterior part of the third ventricle. We emphasize that seizures can be associated with surgical manipulation of the fornix during the endoscopic approach and hypothalamus during resection, with consequent homeostatic disturbances (in this case severe hyponatremia) that must be addressed promptly. Although a more aggressive behavior has been described, RGNT have mostly an indolent course, which should be confirmed through long-term follow-up.

## Oncology

Oral presentation

Modulation of the p53-SXC-glutathione axis as a therapeutic tool in glioma

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### Objectives:

- Assess the effect of PRIMA-1<sup>MET</sup> on p53, SXC, and redox homeostasis in glioma.
- Determine if there is an association between p53-mutation and enhanced redox potential in clinical data.

**Background:** The cysteine-glutamate exchanger (system x<sub>c</sub><sup>-</sup>, SXC) is upregulated in glioma, and overactive SXC results in high levels of extracellular glutamate linked to excitotoxicity, seizures, and enhanced tumor survival and invasion. SXC expression has been found to correlate with p53 mutation status, raising the possibility that p53 has a non-canonical role as a transcriptional regulator of the SXC gene *SCL7A11*. p53 restorative agents have emerged as a promising treatment for many cancers, but their specific mechanism and utility in glioma has yet to be explored.

**Methods:** Patient-derived glioma xenolines with known wt-p53, mut-p53, and null-53 genotypes were treated with the p53 restorative agent PRIMA-1<sup>MET</sup> and assessed for cell viability, expression of putative targets, and metabolic changes. For computational analysis, RNA-seq expression data was obtained from the TCGA database for over 600 glioma patients and analyzed for differential expression between mut-p53 and wt-p53 cases. Gene ontology was used to assess for changes in metabolic and functional pathways.

**Results:** Treatment with PRIMA-1<sup>MET</sup> resulted in significant glioma cell death independent of p53 mutation status. Analysis of post-treatment samples did not show evidence of p53 reactivation but did show glutathione depletion and increased expression of redox genes in resistant cell lines. This association between p53 mutation and antioxidant activity was not significant in large-scale patient data, however gene ontology showed upregulation of synaptic signaling functions linked to aberrant SXC activity in the setting of p53 mutation.

**Conclusions:** The observed effect of PRIMA-1<sup>MET</sup> independent of p53 status suggests a primarily off-target mechanism in glioma via disruption of glutathione synthesis. This highlights the applicability of the drug class to a wider range of glioma patients and the potential for synergistic therapies.

## Skull Base

Oral presentation

### Endoscopic endonasal versus microsurgical transsphenoidal approach for pituitary adenomas

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**Objectives:** We conducted this study to compare the efficacy of endoscopic versus microscopic resection for pituitary adenomas.

**Background:** Pituitary adenomas are the third most common intracranial tumors, accounting for ~10-25% of intracranial tumors. There are many surgical approaches for these tumors.

**Methods:** A retrospective analysis of 275 patients with pituitary lesions who underwent endoscopic endonasal and microscopic transsphenoidal surgery from 2008 to 2020 and were followed up for a mean time of 53 month (range 9-118). All procedures were performed by the same senior neurosurgeons.

**Results:** Patients divided into two groups: endoscopic endonasal (145 patients) and microscopic transsphenoidal (130 patients). The mean age was 53.4 ± 10.23 years (range 21-76 years). In an endoscopic group complete tumor excision was achieved in 101 (69.7%) patients, and in microscopic group, it was achieved in 72 (55.4%) patients. Postoperative anterior pituitary dysfunction rate was higher in the microscopic group. However, there was no significant difference between the groups regarding the rate of permanent diabetic insipidus. Postoperative visual improvement was observed in 68.9% of patients in the endoscopic group and 50% in the microscopic group (P < 0.001). Higher percentage of CSF leak was observed in microscopic group as compared to endoscopic group (6.9% vs. 3.8%).

**Conclusions:** The endoscopic endonasal approach was associated with lower rates of postoperative pituitary dysfunction. The endoscopic technique also improved gross total resection rates.

## Hydrocephalus

Oral presentation

Quality of life outcome in patients with idiopathic normal pressure hydrocephalus: a 11-year follow-up study

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**Objectives:** This study evaluated the long-term clinical and quality of life (QOL) outcomes of Idiopathic normal pressure hydrocephalus (iNPH) patients after ventriculoperitoneal shunt (VPS) implantation. Factors influencing QOL in iNPH were also investigated.

**Background:** iNPH represents an insidious type of dementia considered reversible after shunt placement. Although the clinical outcome has been widely studied, few studies have reported on QOL after surgery.

**Methods:** From 2009 to 2020, a single-institution retrospective study was conducted to compare shunted iNPH patients with a homogeneous control group. QOL was analyzed using the SF-36 questionnaire with yearly follow-up for as long as 11 years. Severity of symptoms, comorbidities, and clinical data were also recorded.

**Results:** Among 187 treated patients, 15 had died at the time of the authors' evaluation, and 45 did not match the inclusion criteria. The mean  $\pm$  SD (range) follow-up was  $118.5 \pm 4.2$  (18–132) months. QOL improved in 103/127 (81%) patients through 5 years after shunt surgery, although it remained lower than that of the control group ( $p < 0.0001$ ). The SF-36 score reduced progressively, reaching baseline at 5–7 years of follow-up and decreased to below baseline at 7–11 years of follow-up ( $p < 0.0001$ ). Predictors of improved QOL were younger age ( $p < 0.001$ ), lower body mass index (BMI) ( $p < 0.001$ ), and better Mini-Mental State Examination (MMSE) performance ( $p < 0.001$ ) before surgery. Decreased postoperative QOL was associated with cerebrovascular disease, diabetes, and severity of symptoms (gait and cognition) at presentation ( $p < 0.001$ ).

**Conclusions:** VPS implantation, along with a strict and comprehensive follow-up, has been shown to improve QOL in iNPH patients for as long as 5 years after surgery. Younger age, lower BMI, and better MMSE score are positive predictors of improved QOL after shunt placement.

## Neurovascular Surgery

Oral presentation

Intraoperative neurophysiological monitoring in surgical treatment of spinal dura arteriovenous fistulas: long-term outcome

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**Objectives:** This study aimed to elucidate the impact of intraoperative neurophysiological monitoring (IOM) during surgical exclusion of spinal dural arteriovenous fistulas (SDAVFs).

**Background:** SDAVFs are rare but potentially reversible cause of progressive myelopathy. The role of IOM during surgery of SDAVFs is still unclear. Surgical disconnection of SDAVFs is a straightforward procedure with a high success rate and ideally no risk of recurrence or incomplete treatment. Besides, neurological deterioration after surgery was reported by several authors and constitutes still an unsolved problem.

**Methods:** This study included ten patients who underwent microsurgical treatment aided with IOM for SDAVFs. The IOM integrated somatosensory-evoked potentials, motor-evoked potentials, and free-running electromyography. All patients were evaluated at admission and follow-up (3, 6, 12, and 24 months) with Aminoff–Logue Disability Scale for Gait (G-ALS) and Micturition–Aminoff–Logue Disability Scale (M-ALS). Logistic regression analysis was performed to detect clinical risk factors related to the outcome.

**Results:** It was registered the absence of significant modifications of IOM in six cases, improvement of at least one IOM parameter in 2 cases, and transient decrease of IOM parameters in 2 cases. Patients with improved IOM parameters showed postoperative improvement in motor function ( $p < 0.05$ ). G-ALS and M-ALS at 3-month follow-up did not improve significantly compared to preoperatively G-ALS and M-ALS ( $p > 0.05$ ). G-ALS and M-ALS improved significantly at one year and last follow-up compared to the preoperative AL-Score ( $p < 0.05$ ). At logistic regression analysis, the ALS score at 24-month follow-up was directly associated with the preoperative G-ALS ( $p < 0.05$ ), M-ALS ( $p < 0.05$ ), and intraoperative improvement of IOM ( $p < 0.05$ ).

**Conclusions:** IOM has been crucial to manage the transient decrease of evoked potentials, maybe preventing postoperative deficit due to fistula occlusion. IOM predicted the absence of new postoperative neurological deficits in all patients.

## Oncology

Oral presentation

MR-guided focused ultrasound induced blood-brain-barrier opening for brain metastasis

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**Objectives:** This review aims to provide an overview of transcranial low-intensity MRgFUS application for blood–brain barrier (BBB) disruption and a comprehensive overview of the most relevant evidence in the treatment of brain metastases (BMs).

**Background:** Although the therapeutic armamentarium has been expanded from innovative surgical techniques and radiotherapy, to include target therapies and immunotherapy, the prognosis of BMs remains poor. Despite the proven efficacy of numerous compounds in preclinical studies, the limited penetration of promising therapeutic agents across the BBB remains an unaddressed issue.

**Methods:** Review

**Results:** Recently, low-intensity magnetic resonance-guided focused ultrasound (MRgFUS) in combination with microbubbles has shown to overcome vascular and cellular transport barriers in the brain and tumor microenvironment resulting in increased drug diffusion and preliminary effective results. Preclinical studies have investigated the increased penetration of many therapeutic agents, including doxorubicin, trastuzumab, and ipilimumab into the central nervous system with promising results. Figure 1 represents the action of low-intensity MRgFUS causing blood-brain barrier transient disruption through collapse and inertial expansion of systemically administered microbubbles, allowing the penetration of drugs into the central nervous system.

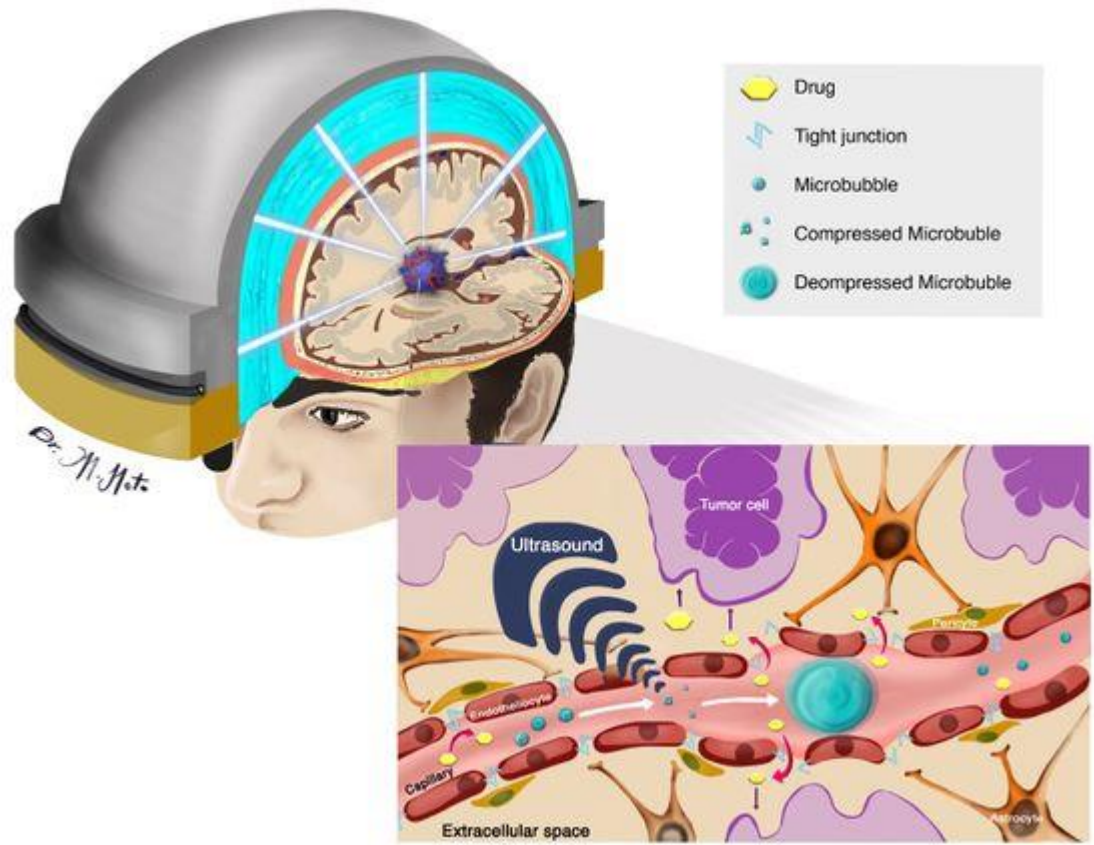


Figure 1. Copyright Manfredi Noto

**Conclusions:** Anticancer drugs combined with MRgFUS-induced BBB opening have demonstrated to improve animal survival and slowing tumor progression. On this trail, the first clinical trial has been recently launched and the results hopefully will provide evidence for the safety and efficacy of drug delivery enhanced by MRgFUS-induced BBB opening in BMs.

## Oncology

ePoster presentation

### Surgical management of meningiomas in elderly patients: retrospective study

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**Objectives:** This study aimed to evaluate the impact of surgical resection of intracranial meningiomas in elderly patients.

**Background:** In elderly patients with a low-performance status associated with a decline in physical function or various comorbidities, asymptomatic small intracranial meningiomas are often followed by repeated radiological examinations without treatment, as most meningiomas have an indolent course caused by their benign biological features. Nevertheless, surgical intervention was suggested to be essential for the treatment of intracranial meningiomas to improve or maintain patients' quality of life. However, few studies have assessed the surgical outcomes of intracranial meningioma removal in elderly patients.

**Methods:** A total of 82 patients with intracranial meningiomas were divided into elderly (>75 years old, n = 42) and younger (<75 years old, n = 40) groups. Clinical and radiological data were retrospectively analyzed. The surgical approach, especially in elderly patients, was based on meticulous respect of the perilesional parenchyma and vascular structures.

**Results:** Total tumor removal was achieved in 79% of elderly patients, which was similar to that in young patients (85%). The average preoperative Karnofsky performance scale (KPS) score in elderly patients was significantly lower than that in young patients (69.1 vs. 91.4, respectively;  $p < 0.0001$ ). However, the average change in the KPS after surgery was similar between the two groups ( $p = 0.34$ ). Histopathological grading revealed that the incidence of malignant meningioma (World Health Organization grades II and III) was significantly higher in elderly patients than that in young patients (44% vs. 14%, respectively;  $p = 0.004$ ). Among meningiomas showing chronological progression, World Health Organization grade II and III meningiomas accounted for 71% of tumors in elderly patients, but only 21% in younger patients ( $p = 0.01$ ).

**Conclusions:** These data suggest that surgical removal of meningiomas may be a safe and useful treatment strategy in elderly patients.



## Neurovascular Surgery

ePoster presentation

A rare case of extremely delayed symptomatic vasospasm following convexity meningioma surgery

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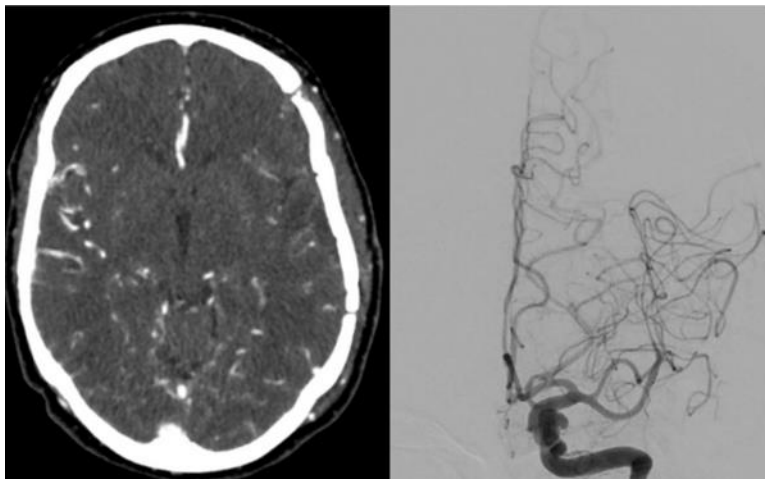
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**Objectives:** The following case aims to document an extremely rare complication of symptomatic vasospasm twenty-five days after complete excision of a left frontotemporal meningioma, and emphasize the influence of early diagnosis and treatment on the prognosis.

**Background:** A 64-year-old woman with past history of hypertension had recurrent mild headaches and was investigated with head CT scan which showed a left frontotemporal extra-axial lesion with 30x15mm. MRI scan revealed a homogenous contrast enhancing lesion with a "dural tail" suggesting meningioma. An MRI one year later revealed mild growing (2mm) and surgery was indicated.

**Methods:** Frontotemporal craniotomy was performed and Simpson 0 removal was achieved with no complications. Post-operative CT scan had no significant amount of subarachnoid hemorrhage or other complications and the patient was discharged 2 days after surgery with no neurological deficits.

**Results:** Histology revealed meningothelial meningioma, WHO grade 1. Twenty-five days after surgery the patient developed sudden motor aphasia and CT-angiography revealed diffuse vasospasm in the left M2 and M3 MCA segments. Digital subtraction angiography was performed along with chemical angioplasty using nimodipine (3mg), administered in the left ICA, with mild improvement in arterial caliber. The patient totally recovered from aphasia the day after and is without neurological deficits in 1 year follow-up.



**Conclusions:** Symptomatic vasospasm following meningioma surgery is described in literature as a rare complication, and it is mostly described following cranial base surgery. In this case the location was frontotemporal convexity which is even less common.

We conclude that even minimal vessel manipulation during surgery and only a slight amount of subarachnoid hemorrhage is sufficient to vasospasm development, and a high index of suspicion is required for early diagnosis and treatment of this potentially devastating condition.

## Oncology

ePoster presentation

### Aggressive high cervical chordoma: surgical technique and outcome after complete resection and reconstruction with free vascularized fibular graft

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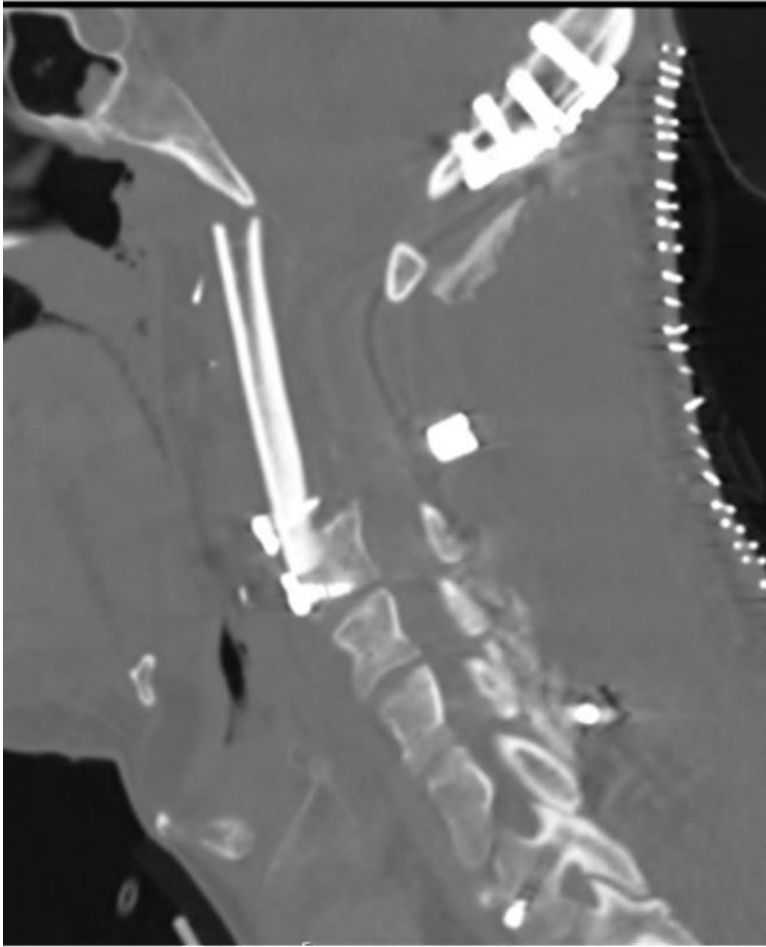
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**Objectives:** We report a rare extensive high cervical chordoma and describe the surgical details and pitfalls of excision and reconstruction with free vascularized fibular graft.

**Background:** A 39-year-old male with no relevant past history presented with dysphagia, dysphonia and mechanical neck pain, starting two months earlier.

Cervical MRI showed an extensive lesion (9.0x7.4x6.2cm) from C1 to C3, centered on the left C2-3 intervertebral foramen, with epidural spinal cord compression, left vertebral artery involvement and paravertebral and retropharyngeal extension. The lesion had well-defined contours and homogenous contrast enhancement. Trans-pharyngeal biopsy was performed with histological diagnosis of poorly differentiated chordoma. Neurosurgery and Plastic Surgery teams decided to attempt an en bloc resection of the lesion.

**Methods:** Surgery was performed in two different days (one day interval). First, occipitocervical fixation with lateral mass and pedicle screws in C4-T1, allowing dissection of the posterior component of the tumor. Two days later tumor resection via anterior cervical approach with mandibulotomy was performed along with reconstruction with free vascularized fibular graft placed between the clivus and C4 for anterior column support. Due to extensive invasion of the pharyngeal wall, en bloc resection was not possible, but a gross complete excision was achieved. After surgery the patient was placed into a halo-vest fixation.



**Results:** Histology confirmed diagnosis of poorly differentiated chordoma and post-operative MRI confirmed complete tumor excision. The patient had grade 3 tetraparesis with total recovery in the following weeks. As the lesion was completely removed, no adjuvant treatments were required. There were no complications regarding the graft closure and anastomosis.

**Conclusions:** This case describes a very rare lesion and the surgical difficulties of the technique. Although the patient is well 6 months after surgery, long-term follow up is required to evaluate the effectiveness of this highly aggressive procedure.

## Epilepsy

ePoster presentation

Prediction of electroencephalographic signals of epileptic seizures using fuzzy-neural logic

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**Objectives:** According to the physiological structure of the onset of an epileptic attack, more complex neural structures have a better ability to model the signal during the attack, so in this article, considering the nonlinear behavior of brain signals and the dynamics of the recorded brain signals, the adaptive neural network (ANFIS) is presented to predict epileptic attacks.

**Background:** Electroencephalogram signals (EEGs) show the electrical activity of brain neurons. EEG is a non-invasive method that can be used to detect abnormal brain activities. Seizure is one of these abnormal activities and is the most common manifestation of epilepsy. Spikes are the most important characteristic of the seizure prone EEG signals. By detecting spikes, it is possible to detect epileptic seizures from EEG signals.

**Methods:** In this research paper, the descriptive EEG signals of Anderzjack and colleagues were used, which includes 5 groups A to E, and each group of data contains 100 EEG signals (for 23.6 seconds) belonging to two cerebral hemispheres. The signal sampling frequency is 173.6 Hz with 12-bit resolution. To check the results of neural-fuzzy logic training, we analyzed epileptic signals by various methods and compared the output signal by neural-fuzzy logic and real network. In this experiment, three training structures fcm-back propagation and fcm-hy lsb back propagation and sub clustering back propagation were used.

**Results:** According to the conducted experiments, the best model for training and predicting epileptic attacks is sub clustering back propagation time series.

**Conclusions:** Because the time and number of attacks are determined according to the range of signal changes and its peak values, therefore, predicting the brain signal is the basis for predicting nervous attacks, and in this research, finding the best model for training and predicting epileptic attacks was done.

## Oncology

Oral presentation

### Supramaximal frontal glioma resection through a minimal approach: a technical note

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**Objectives:** We aim to review the surgical anatomy of the frontal lobe, give a detailed description of our keyhole frontal lobectomy technique, and analyze our surgical results.

**Background:** Minimally invasive (MI) approaches for brain tumors have become popular because they reduce soft tissue damage and bone resection and enhance patients' postsurgical recovery. Deep anatomical knowledge and meticulous surgical technique are paramount for obtaining a radical resection.

**Methods:** We retrospectively reviewed patients with newly diagnosed frontal gliomas treated with a keyhole approach between 2016-2022 with supramaximal resection. Demographic and clinical data were extracted. Surgeries were done asleep and awake. One formalin-fixed cadaveric head was dissected for demonstration of the surgical anatomy. Kaplan-Meier curves were used for survival analysis.

**Results:** Out of 790 craniotomies, 47 patients met our inclusion criteria. The MI approach consisted of four basic steps: 1) gross debulking of the frontal pole and identification of the anterior fossa, 2) subpial dissection of the frontal lobe with a posterior direction, skeletonization of the olfactory nerve and identification of the sphenoid ridge and optic nerve, 3) medially directed dissection to expose the falx cerebri, corpus callosum and interhemispheric structures, and 4) posteriorly directed dissection to the posterior limit of the tumor, guided by motor mapping and motor evoked potentials, avoiding an inferior axial plane defined by the corpus callosum, to avoid opening the ventricle. A fifth step can be added for non-dominant lesions by resecting the inferior frontal gyrus. Five complications were recorded in the perioperative period. The mean length of hospital stay was of 3.3 days. Median follow-up for low-grade gliomas was of 41.3 months, with only one progression. Median progression-free survival and overall survival were of 14.8 and 23.9 months for high-grade gliomas.

**Conclusions:** Supramaximal frontal glioma resection can be achieved through MI approaches without additional risks added.

## Spine

Oral presentation

Nerve growth factor-laden anisotropic silk nanofiber hydrogels to regulate neuronal/astroglial differentiation for spinal cord repair

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### Objectives:

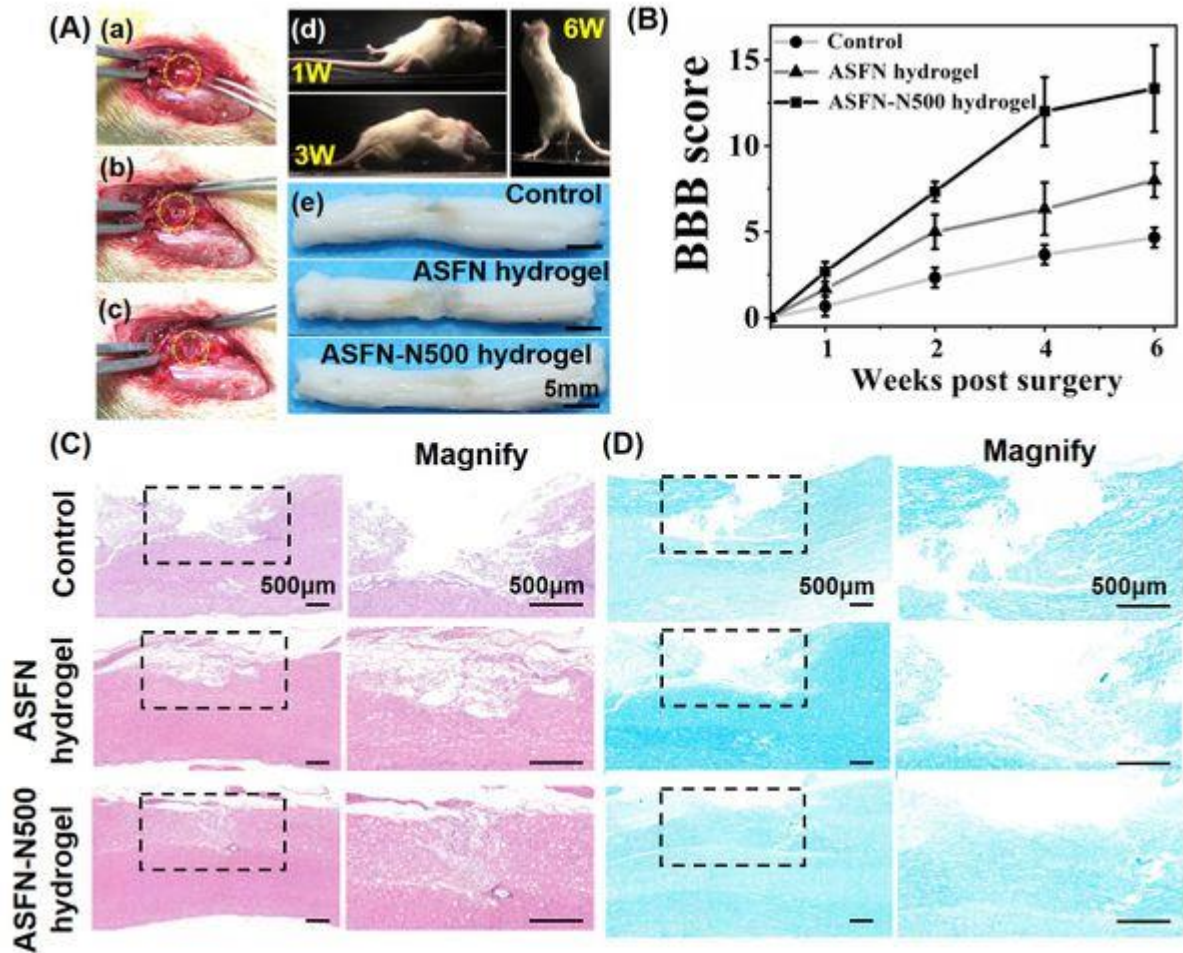
To design functional biomimetic material for treatment of severe spinal cord injury (SCI)

**Background:** Scarless spinal cord regeneration remains a challenge due to the complicated microenvironment at lesion sites. Neural-friendly microenvironments for SCI treatment have been pursued. Multiple biomaterials with physical and biochemical cues were developed to rebuild blood vessel networks, facilitate neuronal reconnections, and stimulate axon regeneration and migration. Aligned topography, extracellular matrix microstructure mimics, suitable mechanical signals, and various neuronal growth-stimulating growth factors or glia-associated inhibitor drugs have been introduced to biomaterial systems, creating desired niches to promote the SCI repair. However, they have been unable to achieve the restoration of function.

**Methods:** We examined the effect of nerve growth factor (NGF)-laden aligned silk fibroin nanofibers (SFN) hydrogels in neural stem cells and the injured spinal cords of SD female rat respectively, following histological, behavioral, microscopic, immunofluorescence.

**Results:** the NGF was loaded inside aligned SFN hydrogels with optimized mechanical properties and aligned microstructures matched to the neural niche. The amount of NGF was optimized to regulate the neural/astroglial differentiation and to obtain the differentiation ratios similar to those found in normal spinal cord tissue. In vitro studies revealed that both physical and biochemical cues influenced the proliferation, anisotropic migration, and differentiation behavior of the various neural cells, suggesting a suitable bioactive microenvironment for spinal cord repair. The in vivo results confirmed these findings, where these functionalized biomaterials promoted scarless tissue

regeneration with improved functional recovery.



**Conclusions:** NGF was immobilized in aligned SFN hydrogels to construct bioactive niches with multiple physical/biological cues for neural tissue regeneration. The bioactive hydrogels stimulated the migration and differentiation of eNSCs, supporting a favorable bioactive microenvironment *in vivo* to guide scarless spinal cord regeneration. The regenerated spinal cords had similar microstructures to that of normal spinal cord tissue.



## Skull Base

Oral presentation

Endoscopic versus microscopic trans-sphenoidal surgery in the treatment of pituitary adenomas: evaluation of hormonal status and related peri-operative complication

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**Objectives:** To compare the efficacy and outcome of endoscopic and microsurgical operative technique for pituitary adenomas.

**Background:** Endoscopic trans-sphenoidal surgery has successively evolved to be preferred technology in treatment of pituitary adenomas reflecting advantages of superior illumination, improved visualization, and minimal invasiveness, allowing radical resection and decreasing the complications. Therefore, globally, over the past two decades the microscopic technology converted into fully endoscopic approach. The purpose of this study is to compare and evaluate the outcomes and complications of endoscopic and microscopic trans-sphenoidal surgery in the treatment of pituitary adenomas.

**Methods:** From Jan.2011-Jan.2019, 85 patients underwent pituitary adenoma resection, 46 of which microscopic procedure and 39 fully endoscopic technology. A retrospective analysis of the patient's records, and data from post-operative follow-up visits were used to ascertain patient's outcomes.

**Results:** Of the 85 pituitary adenomas removed, 61 were hormonally active, while 24 were nonfunctioning. Mean follow-up was 13, 4 months. The average length of stay was 9 days. Post-operative hormonal assays and MRI disclosed improvement of hormonal status in 85 % microscopically treated, while 99 % in endoscopically operated on. Further on, complications were evidenced in 34, 8 % in microscopically operated group, while only 7, 7 % in endoscopically treated patients.

	Post op improvement of hormonal status	complications
microscopic	28/33 (hormonally active) (84.8%)	16/46 (34.8%)
endoscopic	28/28 (hormonally active) (100%)	3/39 (7.7%)

**Conclusions:** The endoscopic trans-nasal trans-sphenoidal technique is safe and effective method to remove pituitary adenomas. The result of this series suggests that the endoscope provides more complete tumor removal, and reduces the complications. We strongly believe that the advantages of the endoscopic technique will promote this procedure as a future gold standard surgical therapy for pituitary adenomas.

## Skull Base

ePoster presentation

The party wall: redefining the indications of transcranial approaches for giant pituitary adenomas in endoscopic era

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**Objectives:** To redefine the current indications for the transcranial approaches for giant pituitary adenomas in the endoscopic era.

**Background:** The evolution of endoscopic transsphenoidal surgery raises the question of the role of transcranial surgery for pituitary tumors, particularly with the effectiveness of adjunct irradiation.

**Methods:** A critical appraisal of the personal series of the senior author (O.A.) was performed to characterize the patient factors and the tumor's pathological anatomy features that endorse a cranial approach.

**Results:** Traditional indications for transcranial approach include absent pneumatization of the sphenoid sinus, kissing/ectatic internal carotid arteries, reduced dimensions of the sella, lateral invasion to the cavernous sinus lateral to the carotid artery, dumbbell-shaped tumors caused by severe diaphragm constriction, fibrous/calcified tumor consistency, wide supra, para-, and retro-sellar extension, arterial encasement, brain invasion, coexisting cerebral aneurysms, and coexisting separate pathologies of the sphenoid sinus, especially infections. Residual/recurrent tumors and postoperative pituitary apoplexy after transsphenoidal surgery require individualized considerations.

**Conclusions:** Transcranial approaches still have a critical role in giant and complex pituitary adenomas with wide intracranial extension, brain parenchymal involvement, and encasement of the neurovascular structures.

## Skull Base

Oral presentation

Optic foraminotomy versus anterior clinoidectomy for small superior-projecting paraclinoid aneurysms: visual and angiographic outcome evaluation

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**Objectives:** In this study, OF and AC were compared for small superior-projecting paraclinoid aneurysms assuming visual and angiographic results as outcome measures. Indications for OF are also discussed.

**Background:** Optic foraminotomy (OF) has been recently proposed as an alternative to anterior clinoidectomy (AC) for selected types of paraclinoid aneurysms.

**Methods:** Data of patients who underwent surgery for a paraclinoid aneurysm in the last 10 years were collected across 3 tertiary hospitals. Small to regular-size and superior projecting aneurysms were sorted. Multiple and complex aneurysms were excluded. Records of patients who went through OF were compared with those of patients who underwent AC. Neurologic outcome was reported as a modified Rankin Scale. Aneurysm complete occlusion rate and rate of approach-related worsened vision were selected as outcome measures of efficacy and safety, respectively, of the OF versus AC. Unpaired t test and  $\chi^2$  test were used for numerical and categorical variables, respectively. A P value less than 0.05 was considered statistically significant.

**Results:** OF and AC groups involved 18 and 25 patients, respectively. Complication rate, overall neurologic outcome, rate of approach-related worsened vision, and complete occlusion rate did not differ between the groups. The average follow-up was  $51 \pm 34$  and  $60 \pm 41$  months in the OF and AC groups, respectively.

**Conclusions:** Compared to AC, OF did not show either a higher rate of approach-related worsened vision or a lower aneurysm complete occlusion rate. OF can be considered a valid alternative to the AC for small superior-projecting dorsal ICA wall paraclinoid aneurysms.

## Skull Base

ePoster presentation

### Working corridors to Meckel's cave trigeminal schwannomas

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**Objectives:** The present study focuses on the infratrochlear (IT) transcavernous, anteromedial (AM), and anterolateral (AL) approaches, analyzing their feasibility, indications, advantages, and limitations.

**Background:** Understanding the working corridors used in the interdural approach to Meckel's cave is critical for the treatment of trigeminal schwannomas.

**Methods:** Morphometric data of Meckel's cave, porus trigeminus, IT transcavernous, AM, and AL corridors were obtained from ten formalin-fixed, latex-injected cadaveric heads. Exposure areas, volumes, and opening angles of each corridor were calculated.

**Results:** The volume of the IT transcavernous corridor was the largest, while the opening angle of the AM middle fossa triangle was the largest.

**Conclusions:** The AM middle fossa corridor is strategic in schwannomas mainly involving Meckel's cave with a minor extension into the posterior fossa. It allows gross total resection through the opening of the porus trigeminus.

## Oncology

Oral presentation

### Supratentorial high-grade gliomas: maximal safe anatomical resection guided by augmented reality high-definition fiber tractography

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#### **Objectives:**

In this study, the authors aimed to evaluate the safety and efficacy profiles of HDFT-F microscope- based AR cytoreductive surgery for newly diagnosed supratentorial HGGs.

**Background:** The theoretical advantages of augmented reality (AR) with diffusion tensor imaging (DTI)-based high-definition fiber tractography (HDFT) and sodium fluorescein (F) in high-grade glioma (HGG) surgery have not been investigated in detail.

#### **Methods:**

Data of patients with newly diagnosed supratentorial HGGs who underwent surgery using the AR HDFT-F technique were reviewed and compared with those of a cohort of patients who underwent conventional white-light surgery assisted by infrared neuronavigation. The safety and efficacy of the techniques were reported based on the postoperative Neurological Assessment in Neuro-Oncology (NANO) scores, extent of resection (EOR), and Kaplan-Meier curves, respectively. The chi-square test was conducted for categorical variables. A p value < 0.05 was considered statistically significant.

#### **Results:**

A total of 54 patients underwent surgery using the AR HDFT-F technique, and 63 underwent conventional white-light surgery assisted by infrared neuronavigation. The mean postoperative NANO scores were  $3.8 \pm 2$  and  $5.2 \pm 4$  in the AR HDFT-F group and control group, respectively ( $p < 0.05$ ). The EOR was higher in the AR HDFT-F group ( $p < 0.05$ ) than in the control group. With a mean follow-up of 12.2 months, the rate of progression-free survival (PFS) was longer in the study group (log-rank test,  $p = 0.006$ ) than in the control group. Moreover, the complication rates were 9.2% and 9.5% in the study and control groups, respectively.

#### **Conclusions:**

Overall, AR HDFT-F-assisted surgery is safe and effective in maximizing the EOR and PFS rate for patients with newly diagnosed supratentorial HGGs, and in optimizing patient functional outcomes.

## Functional

Oral presentation

Experience in application of local field potential and connectome in DBS surgery in Hong Kong

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**Objectives:** To review the clinical experience in application of local field potential and connectome in Deep Brain Stimulation (DBS) surgery in Hong Kong.

**Background:** Deep Brain Stimulation (DBS) surgery was first introduced to Hong Kong since 1997. Since then, nearly 500 cases were performed in 3 neurosurgical centres in Hong Kong. Most of the surgeries were performed for treatment of Movement Disorders including Parkinson's Disease and Dystonia etc. Other indications including Epilepsy and psychiatric diseases. Technology evolution in DBS surgery had been making advancement in lead implantation and system programming. In our centre, apart from the use of traditional DBS system, directional DBS lead was introduced since 2018 and the application of Diffuse Tractography Imaging (DTI) guided programming as connectome study was implemented since 2019. Recently, the newly launched DBS system with function of recording of Local Field Potential (LFP) was started to be used since 2022.

**Methods:** We had retrospective review of all DBS cases from May 2000- May 2023. Totally we have 121 DBS cases performed. Among all, we have 31 DBS cases with 62 directional leads implanted, and 7 DBS for Parkinson's Disease and 1 DBS for epilepsy cases with LFP recording system implanted.

**Results:** We had analyzed clinical outcome of our patients with advanced technology applied including directional leads, imaged-guided programming and local field potential. All of them showed promising results in postoperative follow-up.

**Conclusions:** Evolution of technology advancement in DBS surgery showed positive impact to our DBS surgery for movement disorder and epilepsy. There will be a great potential in improvement of patient outcome in future functional neurosurgery.

## Spine

ePoster presentation

### Pott's disease of the cervical spine: a case report of a rare tubercular localization

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**Objectives:** Discuss through a new case of a cervical spine pott's disease the characteristics related to this condition.

**Background:** Tuberculosis of the central nervous system accounts for approximately 1% of all cases of tuberculosis, among which 50% involve the spine. Lumbar and thoracic spines are the most frequent localization of this infection.

**Methods:** Here we report a rare case of cervical localization of tuberculosis, and proceed through a review of the literature into radiological and therapeutic discussion of this disease.

**Results:** We report the case of a 19 years-old female patient with no pathological history. She reports cervical pain since 2 months resistant to medication. Neurological examination didn't show any motor or sensitive deficit, or any abnormalities in reflexes. Standard Radiography and cervical CT scan showed a lytic lesion of C2 with an evident compression on the spinal cord. The MRI confirmed the diagnosis showing a complete destruction associated to an epiduritis at the level of C1 and C2. A surgical biopsy was realized, and pathological examination concluded to a tubercular localization of the cervical spine. The patient was reoperated. An osteosynthesis of the cervical Spine performed, followed by 12 months of anti tuberculosis treatment with a good outcome. After 3 years of clinical and radiological follow up, the patient had neither recurrence of the pain, nor neurological signs. Imaging showed a total disappear of the lytic lesions.

**Conclusions:** Prognosis for cervical pott's disease has been improved by early diagnosis and rapid intervention. A high degree of clinical suspicion is required if patients present with chronic pain, even in the absence of neurologic symptoms and signs. Medical treatment is generally effective. Surgical intervention is necessary in cases with marked bony involvement, abscess formation, or neurological deficit.

## Spine

ePoster presentation

### Primary cervical localization of myxoid liposarcoma: case report and review of the literature

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**Objectives:** Report a rare case of cervical liposarcoma, and discuss the characteristics related to this condition.

**Background:** Liposarcoma is the most common soft tissue sarcoma in adults. The myxoid subtype is the second most frequency lesion, accounting for 30% to 40% of cases. Extrapulmonary metastatic locations are often found especially in the skeleton, with a propensity to the spine. However, primary spinal involvement is rare, since only five cases have been identified so far. Hereby, we present a case of primary liposarcoma of the cervical spine.

**Methods:** We report the case of an 80-year-old patient, suffering from arterial hypertension, who presented for the onset of a motor deficit in the 4 limbs since 15 days. Physical examination found a spastic quadriplegia. MRI revealed a spinal cord compression by an extensive epiduritis ranging from C3 to C7. The diagnosis of infectious spondyliscitis was considered at first. The patient was operated for medullar decompression. Pathological examination concluded to a grade 2 myxoid liposarcoma.

**Results:** Liposarcoma is the most common soft tissue tumor. It accounts for about 20% of all malignant mesenchymal tumors. Five histological types are described. Myxoid liposarcomas are usually found in the extremities, especially the thighs. Unlike other types of liposarcoma which typically metastasize to the lungs, myxoid liposarcomas tend to spread to extrapulmonary sites, such as retroperitoneum, mediastinum, chest wall, peritoneum, and heart. This predilection can be explained by the abundance of adipose tissue at these locations. Complete surgical resection combined to radiotherapy is usually sufficient for local control. Chemotherapy may be indicated in case of metastases. Nevertheless, prognosis remains reserved.

**Conclusions:** Liposarcoma is the most common soft tissue tumor in adults. However, primary spinal involvement is very rare. Despite of its rarity, our case demonstrates that liposarcoma should be discussed as a differential diagnosis of cervical tumors.



## Oncology

ePoster presentation

### Extraventricular neurocytoma of the medullar conus: an exceptional pathologic diagnosis

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**Objectives:** Discuss through a rare case of an extraventricular neurocytoma the characteristics related to the atypical localizations for this condition.

**Background:** Central neurocytoma is currently recognized as a distinct class of central nervous system (CNS) tumors. It is classically defined as a typically benign supratentorial mass located in the lateral ventricles or the third ventricle. Extraventricular localizations are very rare, in particular those in the spinal cord, reported only in sporadic cases. We report a new case of medullar neurocytoma.

**Methods:** We present the case of a patient operated for an intramedullary tumor which was thought to be an ependymoma on imaging. Only pathologic exam redressed the diagnosis by revealing an extraventricular neurocytoma.

**Results:** We report the case of a 12-year-old girl, who presented with the progressive onset of a weakness of the lower limbs since 6 months, associated with a sphincteric dysfunction since 1 year. Neurological examination revealed flaccid paraplegia. Magnetic resonance imaging showed an intramedullary intradural tumor at the level of lower thoracic spine, with extensive syringohydromyelia. The tumor was in iso-T1 and slightly in hyper-T2. Homogeneous enhancement is observed after injection of Gadolinium. The diagnosis of ependymoma was initially suspected. The decision was to operate the patient. A laminectomy from D10 to D12 was performed, followed by complete resection of a haemorrhagic, friable, grayish intramedullary tumor surrounded by a thin white capsule. Postoperative, the patient developed transient constipation, and no motor improvement was observed until discharge. Pathological exam with immunohistochemistry redressed the diagnosis towards a grade II extraventricular neurocytoma. No adjuvant treatment was undertaken. 5 months after the surgery, the patient could walk with crutches, and the sphincter disorders have regressed.

**Conclusions:** Central medullary neurocytoma is a rare entity with only sporadic cases reported in the literature. Surgical resection is the reference treatment and the diagnosis is based on an immunohistochemical study.

## Spine

ePoster presentation

### Pediatric lumbar spine disc herniation revealed by a scoliosis: case report and review of the literature

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**Objectives:** Discuss through a rare case of a paediatric lumbar disc herniation the characteristics related to this condition.

**Background:** Scoliosis is to be distinguished from a scoliotic attitude which is not associated to a deviation in the three planes of space. This attitude is usually symptomatic of spinal pathologies, especially in children. But it rarely reveals lumbar discopathy.

**Methods:** We report the case of an 14-year-old patient who presented for a scoliotic attitude. The patient reported a left L5 lumbosciatalgia incompletely improved by medical treatment. Physical exam did not show any motor deficit. Lumbar CT scan confirmed lumbar scoliosis with a Cobb angle of 22°. MRI showed a L4-L5 lumbar disc herniation. The patient underwent surgery with an L4-L5 discectomy through a unilateral approach. Postoperative, the sciatica completely disappeared. A one year follow up showed a normalization of the scoliosis.

**Results:** Scoliosis is one of the key symptoms in the diagnosis of spinal pathologies, especially in young people. It may be indicative of lower limb length discrepancy, vertebral infection, or spinal tumors. Its association with lumbar disc herniations is rare because of the rarity of discopathies in young patients, and due to the absence of obvious mechanical correlation between the scoliotic attitude and the onset of the lumbar spine discopathy.

**Conclusions:** Association between lumbar disc herniation and scoliotic attitude in children is controversial. A clinical and biomechanical study may better emphasize a pathology which is still underestimated in young subjects, and therefore optimize therapeutic approaches according to the physiological particularities of such patients.

## Hydrocephalus

Oral presentation

Endoscopic findings and clinical outcome of 'ETV' in infants under six months in Tanzania

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**Objectives:** To determine the association between the sociodemographic, clinical and the endoscopic anatomical findings with the outcome in Infants who underwent Endoscopic Third Ventriculostomy (ETV) at Muhimbili Orthopaedic Institute (MOI) from 2012-2020.

**Background:** It is generally believed that ETV in Infants and children under 2years do not offer a favourable outcome. However outcome of VP-Shunt is also not favourable in Low- Middle Income (LMIC) setting. We have ETV as the first approach before VP-Shunt.

**Methods:** A retrospective analysis of a prospectively maintained ETV under 6 months hydrocephalus cohort was done. Data was collected on demographic, clinical, and anatomical characteristics with the 12 months follow up. The bivariable relationships were tested on two age groups (<2 months vs >2 months) using Chi-square, and Mann-Whitney U tests. Statistical significance was set at 0.05, and all analysis was done on R studio.

**Results:** We admitted 277 patients with a mean age of  $2.67 \pm 1.7$  months during the study period. Most patients were male (60.3%) and two months or less (51.9%). The older patients were more likely to have an abnormal Occipital Frontal Circumference (OFC), with a mean of  $51.4 \pm 6.3$  cm ( $p < 0.001$ ). Younger infants had a normal cortical mantle (51 vs 29,  $1.96(1.12, 3.49)$   $p = 0.018$ ). Endoscopic evidence of infection and a scarred cistern was associated with a clinical diagnosis of infection  $p < 0.05$ . Patients from a rural setting were more likely to have evidence of infection on endoscopy [ $1.7(1.05, 2.96)$   $p = 0.025$ ]. Furthermore, patients who had an abnormal OFC had a thin cortical mantle and a not intact septum ( $P < 0.001$ ). The ETV success rates at 4, 26, and 52 weeks were 93.1%, 76.1%, and 63.4%, respectively. No difference was seen between age groups ( $p = 0.34$ ).

**Conclusions:** ETV is feasible in infants in LMIC. There is no limitation for ETV in neonates.

## Neurovascular Surgery

Oral presentation

Microsurgical management of brain arteriovenous malformations (AVMs) in North Okkalapa General Hospital, Myanmar

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**Objectives:** The main objective was to describe microsurgical management of brain AVMs, admitted at North Okkalapa General Hospital, Yangon, Myanmar with limited resources and to determine the outcome of patients.

**Background:** Among 150 cases of hemorrhagic stroke in single center, incidence of brain AVMs was 5-10 / year and operated 3-5/year during study period.

**Methods:** The prospective study was conducted from December 2016-2020.

Total 16 patients were selected to detect clinical presentation.

The results are based on collected data including imaging studies and analyzed to determine outcomes after surgery, follow up data.

**Results:** There were 9 males ( 56.25 %) and 7 females ( 43.75 %) with 8-57 years of age group and 13 ( 81.25 %) with cerebral hemorrhage ( the most common presentation ) and underwent CT angiography. Another 3 ( 18.75 %) presented with seizures and headaches.

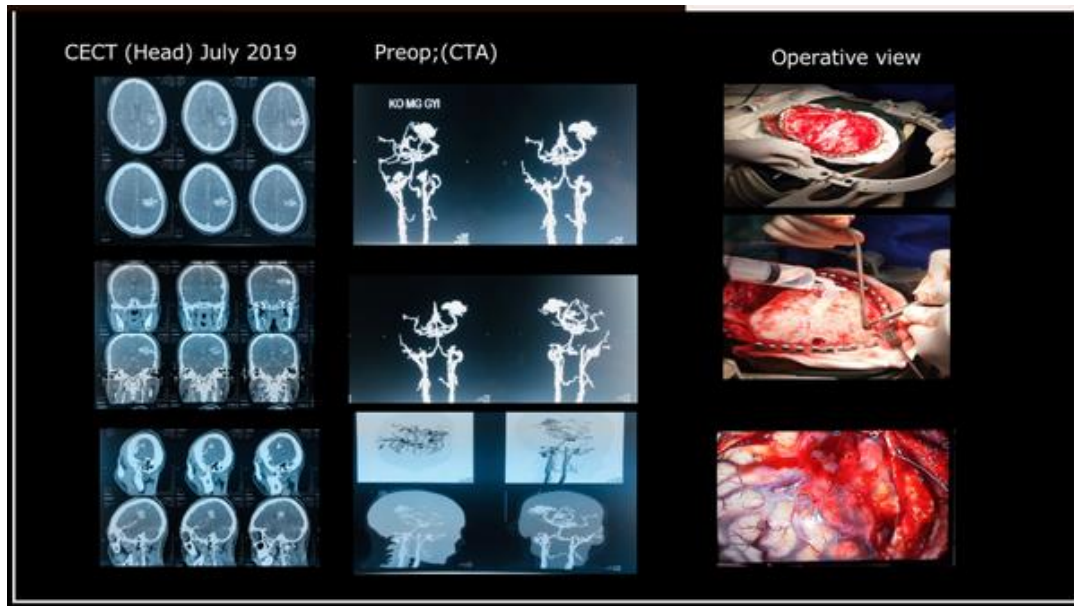
According to this study, Spetzler-Martin Grade II ( 50% ) was the commonest in 8 and Grade III ( 31.25%) in 5. Frontal AVMs ( 12 cases) were the most common( 75%).

The follow up duration was 36 months.

All patients underwent elective microsurgical operation, complete resection was achieved in 14 ( 87.5 %) and 2 (12.5%) had residual and recurrent because of high grade ( IV, V )associated with calcification.

Among 16 patients, outcomes were better for the patients with AVMs smaller than 3 cm in 13 cases ( 81.25%).

Postoperative complication (12.5%) was presented with the significant neurological deficits and recurrent in Grade IV AVM with calcification ( 12.5%) in 2 years after operation.



**Conclusions:** Outcome of microsurgical management for brain AVMs was determined. Microsurgical management can achieve high cure rate even in the hospital with limited facilities for urgent cerebral angiogram and DSA and no facilities for intraoperative angiography.

## Trauma

ePoster presentation

### Posterior-only approach for the management of irreducible traumatic spondyloptosis of thoracolumbar junction

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**Objectives:** To determine the optimal surgical technique for traumatic irreducible spondyloptosis of thoracolumbar junction.

**Background:** The thoracolumbar junction is the most common location of traumatic spinal injuries and contains 50-60% of all fractures of the thoracic and lumbar spine. Spondyloptosis is not very frequent, but one of the most severe types of traumatic injury, that is characterized by a gross violation of spine axis in one or more planes. Traumatic spondyloptosis is divided into reducible and irreducible, depending on the possibility of intraoperative restoration of the spinal axis without resection of the damaged vertebra.

**Methods:** We performed a retrospective analysis of the patients' database admitted in Romodanov Neurosurgery Institute of National Academy of Medical Sciences of Ukraine over the past 4 years (2017 to 2020) to identify all cases with traumatic irreducible spondyloptosis of the thoracolumbar junction.

**Results:** Five patients aged from 18 to 52 years were revealed. The minimum period from injury to surgery was 14 days, maximum 3 months and 2 days. All patients had a neurological deficit of ASIA A at the time of admission. The score by TLICS scale was 8 points. We performed surgery by isolated posterior approach in all cases. As a body replacement system in 2 patients, we used a vertical cylindrical implant (Mesh), in 3 patients - a telescopic body replacing implant. The method of bicortical implantation of transpedicular screws was applied. We managed to achieve the restoration of spine axis in both the coronary and sagittal planes and observed regression of neurological disorders in two patients, in one case to ASIA B, in another to ASIA C.

**Conclusions:** Isolated posterior approach has demonstrated high efficacy in the surgical management of traumatic irreducible spondyloptosis of the thoracolumbar junction, allowed both to restore the axis of the spine and to provide the stability of fusion.

## Spine

ePoster presentation

### Functional outcome following management of chronic Congenital Craniovertebral Junction anomaly. An observational study

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**Objectives:** To evaluate the functional outcome following management of Chronic Congenital Craniovertebral junction anomaly.

**Background:** Congenital Craniovertebral junction (CVJ) anomaly is a complex pathology and management is mostly surgical and it can result in myelopathy and functional disability if not treated on time. Surgical management of CVJ anomaly is intricate because of bony anatomy; and due to the distinct relationships with the brain stem and surrounding neurovascular structures. There are variations in the approaches because of various bony and arterial anomaly involved. Beside these facilities for such surgeries are not easily accessible as it also needs a good infrastructure as well. Timely surgical management of such patients has shown better neurological outcomes. But many times, patient present lately and with established myelopathy due to ignorance or lack of surgical facility close to them. There are no studies till date that have accurately evaluated the results of surgery for patients presenting with chronic CVJ anomaly. Thus, the functional outcome for delayed surgical management in such patients are not known.

**Methods:** In our study, 22 patients underwent decompression, fixation, and fusion, aged 8 to 25 years, with 16 males and 6 females. Three patients underwent trans oral odontoidectomy followed by posterior fixation and in the remaining only posterior fixation was done. The presenting clinical status, surgical variations, complications and post-surgical outcome were evaluated clinico- radiologically. Pre and post operative functional status were assessed by Japanese Orthopedic Association score for atleast one year post surgery.

**Results:** There is improvement in JOA scores in 14 patients (63.63%) even after delayed surgery. Fusion was achieved in 19 patients (86.4%) One patient died of pneumonia, and two had pressure sore. Posterior only approach resulted in is reduction and fusion in 84.50%.

**Conclusions:** Surgery should always be offered in patients of Chronic CVJ anomaly with delayed presentation with chances of improvement.

## Trauma

ePoster presentation

### Determining decision-making classification of traumatic thoracolumbar junction injuries

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**Objectives:** To evaluate the influence of the detail degree of the pathomorphological changes in the osteoligamentous structures on the tactics of the treatment of the patients with the traumatic damage to the thoracolumbar junction.

**Background:** The thoracolumbar junction is one of the most "typical" areas of traumatic changes when exposed to a mechanical load on the human body. Currently, a specific classification for injuries of the thoracolumbar junction has not been developed, therefore, when describing injuries in this zone, grading schemas characterizing the whole thoracic and lumbar spine are used.

**Methods:** A retrospective analysis of the treatment tactics was carried out in 96 patients with traumatic injuries of the thoracolumbar junction. We analyzed the patients' data who underwent both surgical treatment and conservative therapy. All injuries were ranked using F. Magerl et al. and AOSpine classifications. Neurological status was assessed using the ASIA scale (American Spinal Injury Association), the nature of the lesion was specified using the McCormack criteria. Statistical data processing was performed using the Random Forest machine learning algorithm.

**Results:** The nature of the injury makes it possible to unambiguously determine the optimal method of therapy using the classification of F. Magerl et al. with a probability of 58.33%, when applying the AOSpine classification - with a probability of 55.21%. When building models taking into account the nature of damage, the level of neurological disorders and McCormack criteria, it was found that the error in unambiguously determining the most effective method of treatment when using the classification of F. Magerl et al. is 26.04%, when using the AOSpine classification - 21.88%.

**Conclusions:** The use of the AOSpine classification is more promising for the development of a multifactorial algorithm for the treatment of traumatic injuries of the thoracolumbar junction.



## Trauma

Oral presentation

Risk of the vertebral body kyphotic deformity progression in patients with type A1 injuries of the thoracolumbar junction

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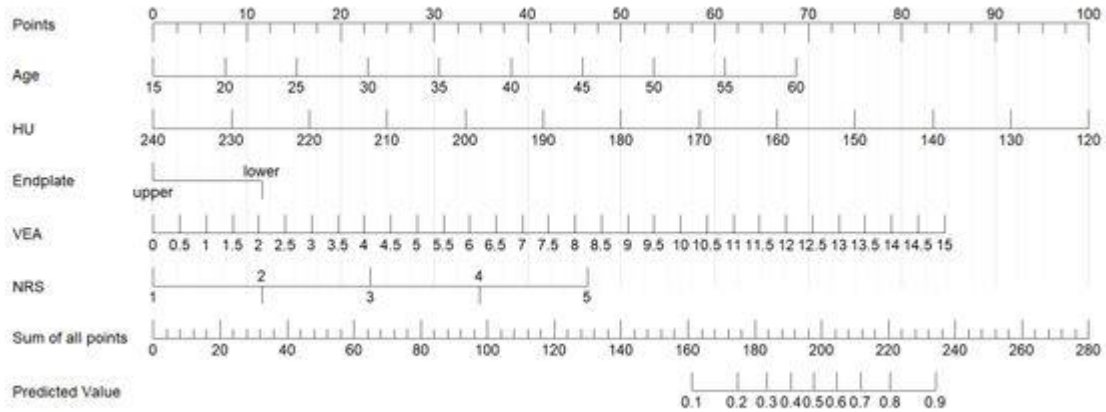
**Objectives:** To evaluate the factors influencing the risk of progression of kyphotic deformity in patients of working age with type A1 traumatic injuries of the thoracolumbar junction.

**Background:** A number of studies within last 10 years shows a high rate of failure of conservative treatment of A1 injuries of the thoracolumbar junction, as evidenced by the progression of kyphotic deformity of the compressed vertebral body. Most of these publications are devoted to osteoporotic lesions in aged patients, while this aspect has been little studied in patients of working age with normal bone density.

**Methods:** We analysed 47 clinical cases of patients with type A1 injuries of the thoracolumbar junction. Gender, age, body mass index, level of damage, location of the damaged endplate (caudal or cranial), bone tissue radiodensity, angular kyphotic deformity of the vertebral body, and pain intensity were considered as predictors. Depending on the presence or absence of deformity progression 2 months after the injury, the patients were divided into two clinical groups. The most clinically significant predictors were identified using the LASSO regression method.

**Results:** When assessing the risk of progression of kyphotic deformity in traumatic injuries of type A1 of the TLJ zone, age, bone density (HU), angular kyphotic deformity of the vertebral body (VEA), and pain intensity (NRS) are of the greatest importance, which demonstrate a directly proportional relationship. A compressed caudal endplate is also associated with a higher risk of post-traumatic progression of angular kyphosis. The nomogram developed using the

mentioned factors makes it possible to quantify the degree of risk when choosing a therapy strategy.



**Conclusions:** The performed analysis made it possible to create a nomogram for predicting the increase in kyphotic deformity of the vertebral body in A1 fractures of thoracolumbar junction.

## Endovascular Neurosurgery

Oral presentation

Endovascular mechanical thrombectomy for acute ischaemic stroke due to large vessel occlusion: long-term outcomes in a Kenyan setting

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**Objectives:** Retrospective assessment of long-term outcomes of patients treated with Endovascular Mechanical Thrombectomy (EMT) in a Kenyan Context.

**Background:** The dire consequences of strokes in Africa are primarily attributable to deficient stroke care, a problem particularly prevalent in sub-Saharan Africa where therapeutic options are primarily palliative due to the absence of acute stroke interventions such as thrombolysis and endovascular mechanical thrombectomy (EMT). The latter was introduced in East Africa in 2016, necessitating an assessment of long-term outcomes of patients treated with EMT in this context.

**Methods:** A retrospective study of 36 patients who underwent EMT for large vessel occlusion (LVO) in the anterior circulation at teaching unit in Sub-Saharan tertiary center. The primary outcome was a 12-month post-discharge modified Rankin Scale (mRS) scores ( $\leq 2$  denoted as favorable). Descriptive statistics were employed for data representation, and Fisher's exact test was used to evaluate associations.

**Results:** Among patients treated with thrombectomy 89% were discharge with 39% independent at 1 year. Complications included vessel dissection 5.5%, cerebral oedema 38.3% and haemorrhagic transformation 11%. Overall mortality was 11% with attributed to EMT complications due to vessel dissection and cerebral edema.

**Conclusions:** The results post-EMT for patients with anterior circulation LVO in Kenya demonstrate modest but comparable outcomes to global centres. Given the typically grave prognosis for LVO stroke patients, it is recommended that this therapeutic intervention is more widely adopted, and that the necessary infrastructure is developed for its optimisation. The Limitations of this study inherent limitations in the primary data due to its retrospective nature and potential bias from single centre/operator selection.

## Trauma

Oral presentation

### Impact of intracranial pressure monitoring on mortality rates in severe traumatic brain injury patients in Kenya

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**Objectives:** The study aimed to assess the impacts of intracranial pressure (ICP) monitoring on mortality rates in severe TBI patients in Kenya.

**Background:** Traumatic brain injury (TBI) represents a significant health challenge globally, with severe implications in low- and middle-income countries (LMICs) like Kenya, where it accounts for 30% of all injury-induced deaths.

**Methods:** A retrospective case-control study conducted at Aga Khan University Hospital Nairobi examined hospital records of TBI patients aged 16-60, admitted to ICU for at least two days, with GCS scores less than 8 upon and 24 hours after arrival. Patients were separated into two groups: those with ICP monitoring (intervention) and those without (control), matched on a 1:1 propensity score basis.

**Results:** Of the 84 patients (42 per group), the majority were male (69%), with a median age of 33. Road accidents were the primary cause of injury (70%). The ICP monitoring method was either Codman Intraparenchymal monitors (52%) or External Ventricular drains (EVDs). Among EVD-monitored patients, intracranial sepsis was reported in 9%. Compared to the control group (52%), the group with ICP monitoring had a lower mortality rate (31%), suggesting that ICP monitoring could significantly reduce mortality (odds ratio 0.41; 95% confidence interval 0.16-0.99; p=0.04). However, it was associated with a higher craniotomy rate and longer ICU stays. ICP monitoring with EVDs correlated with an increased risk of intracranial sepsis.

**Conclusions:** In conclusion, ICP monitoring might feasibly reduce the 30-day mortality rate in LMICs like Kenya. Yet, TBI-related mortality remains high regardless. More extensive studies are required to verify ICP monitoring's role in resource-limited settings and assess functional outcomes at longer intervals (6 and 12 months). The study's retrospective nature, limited sample size, and lack of long-term functional outcome data are its main limitations.

## Global Neurosurgery

Oral presentation

Prognostic significance of perihematomal edema in basal ganglia hemorrhage after minimally invasive endoscopic evacuation

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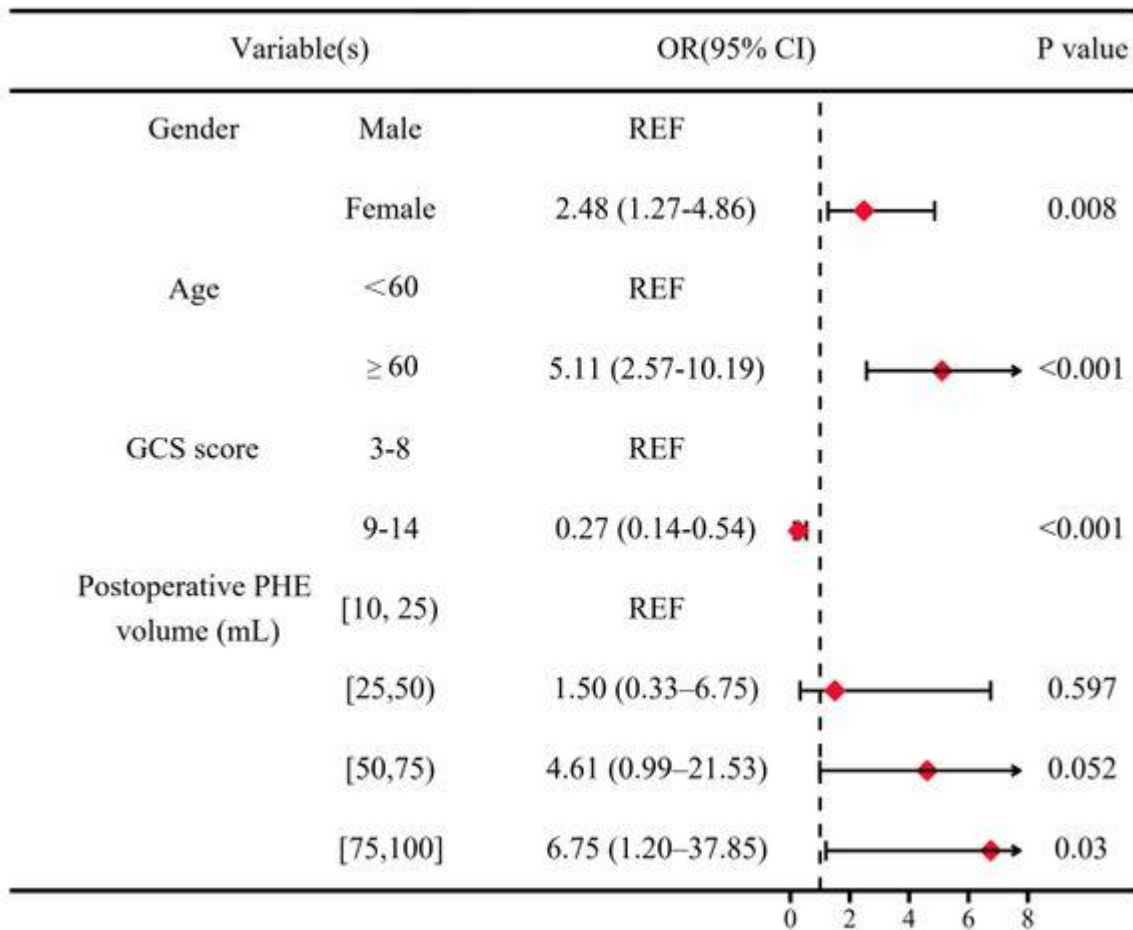
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**Objectives:** We aimed to examine prognostic factors associated with long-term functional dependence (modified Rankin Scale [mRS] score  $\geq 4$ ) in basal ganglia hemorrhage patients after endoscopic evacuation.

**Background:** Spontaneous basal ganglia hemorrhage is a common type of intracerebral hemorrhage (ICH) with no definitive treatment. Minimally invasive endoscopic evacuation is a promising therapeutic approach for ICH.

**Methods:** Two hundred twenty-two consecutive patients who underwent endoscopic evacuation between July 2019 and April 2022 at 4 neurosurgical centers were enrolled prospectively. Patients were dichotomized into functional independent (mRS score  $\leq 3$ ) and functional dependent (mRS score  $\geq 4$ ) groups. Hematoma and perihematomal edema (PHE) volumes were calculated using 3D Slicer software. Predictors of functional dependence were assessed using logistic regression models.

**Results:** Among the enrolled patients, the functional dependence rate was 45.50%. Factors independently associated with long-term functional dependence included female, older age ( $\geq 60$  y), GCS score  $\leq 8$ , larger preoperative hematoma volume (OR=1.02), and larger postoperative PHE volume (OR=1.03, 95% CI: 1.01-1.05). A subsequent analysis evaluated the effect of stratified postoperative PHE volume on functional dependence. Specifically, patients with large ([50, 75) ml) and extra-large ([75, 100) ml) postoperative PHE volumes had 4.61 (95% CI 0.99–21.53) and 6.75 times (95% CI 1.20–37.85) greater likelihood of long-term dependence, respectively, compared to patients with small postoperative PHE volume ([10, 25) ml).



**Conclusions:** A large postoperative PHE volume is an independent risk factor for functional dependence among basal ganglia hemorrhage patients after endoscopic evacuation, especially with postoperative PHE volume  $\geq 50$  ml.

## Trauma

Oral presentation

A retrospective study of cranioplasty with autogenous bone vs bone cement vs customised self-moulded polymethyl methacrylate at a multispeciality hospital

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**Objectives:** To describe our experience using Autogenous bone graft vs Bone cement vs Self-moulded PMMA bone graft for cranioplasty to achieve the best results and avoid complications.

**Background:** Cranioplasty (CP) is a standard procedure performed mainly for anatomical reconstruction of the cranial vault, brain protection, and cosmesis. Nowadays, Decompressive craniectomies (DCs) are the one of common neurosurgical procedures requiring a future cranioplasty and they are usually performed in cases of uncontrolled Intracranial hypertension (ICP). Cranioplasty is associated with complication rates of 15-35%, the most frequent complication is a postoperative infection around 26%.

**Methods:** Between the years 2016 and 2023, a total of 164 patients underwent CP after previous DCs with Autogenous bone, bone cement and customized self moulded PMMA prostheses made by hand with the help of a prosthodontist.

**Results:** Out of 164 cranioplasties, 67 were Autogenous bone graft, 67 were Bone cement, and 30 cases of Customised self moulded PMMA graft was used. The mean age at cranioplasty was 36.5 yrs with Male predominance. MC indication was Traumatic Brain injury followed by Malignant MCA infarct. All DCs were on one-sided FTP and all Bone flap were at least 12cm long in their maximum dimension. The median time between DCs and CP was 5.6 months. All CP patients were followed up for at least 6 months, 20 cases underwent bone flap removal because of infection, 8 (12%) in the Autogenous bone graft group, 12 (20%) in Bone cement, and no infection till now in PMMA.

**Conclusions:** Customised self-moulded PMMA prosthesis is an economical and safer alternative as compared to traditional methods of CP with autogenous bone graft and Hand moulded graft with bone cement.

## Spine

ePoster presentation

### Natural history of intramedullary tumors - case report and review of the literature

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**Objectives:** The goals of this study is to evaluate the natural history of intramedullary tumors conservatively treated and to provide an alternative treatment to surgical intervention.

**Background:** Surgical resection of intramedullary tumors is generally accepted today as the standard care of treatment, but it is occasionally associated with a poor outcome. That's why are only a few mentions in the literature about the non-surgical treatment of these tumors.

**Methods:** We present the case of a 43 years old woman admitted in our hospital in september 2021 for thoraco-lumbar vertebral pain with one month evolution. She had no other symptoms or neurological signs. IRM images of thoraco-lumbar spine showed an intramedullary cystic tumor between T7 and T11, 81 mm long, splitted by several septa. She refused systematically the surgical treatment. We chose a conservative treatment ("wait and see") with clinically and IRM follow-up every 6 months. The last control was in march 2023.

**Results:** The choice of therapy is difficult for patients without neurological deficits: operation versus conservative treatment. The major risk is of an unpredictable development of spinal cord section syndrome. Our patient didn't develop neurological deficits and the imagistic aspect of tumor was stationary. We recommended her oral treatment with dexamethasone 8 mg/day, for 10 days, during painful periods with pain relief. This case had a good evolution after 18 months with no tumor growth on IRM controls which suggests a benign lesion, probably an ependymoma. The patient was able to return to her agricultural work. We made a review of literature to compare our case with other similar cases.

**Conclusions:** Despite the current opinion not all asymptomatic spinal cord tumors have a bad outcome in the absence of surgery. Our case provide additional information for counseling patients with asymptomatic intramedullary tumors to chose a nonoperative treatment.



## Skull Base

ePoster presentation

Diaphragm sella meningioma (endonasal endoscopic vs transcranial approaches). Which one is preferred?

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**Objectives:** Comparison of two approaches to diaphragmatic sella meningioma.

**Background:** The surgical approach to diaphragmatic sella meningioma has been a matter of debate, especially with the improvement of skills in using the endoscopic endonasal approaches. The transcranial approach vs trans sphenoid approach has its own advantages or disadvantages.

**Methods:** We compare these two approaches with a narrative review and present our experiences with our patients. we note the advantage and drawbacks of each approach. 6 patients operate with transcranial and 8 patients operate with the trans-sphenoid approach. The time of operation, post-operation complications, diabetes insipidus, days of admission, rate of gross total resection, and optic nerve damages compare in the two groups.

**Results:** The time of operation is longer in trans sphenoid approach. diabetes insipidus is higher and days of admission are longer In trans sphenoid approach. rate of gross total resection is more in the transsphenoid approach. optic nerve complications are more in the transsphenoid approach. we have not vascular damage.

**Conclusions:** The trans-sphenoid approach could be an alternative to surgery for diaphragmatic sella meningioma, but it has more complications at least in the hands of a beginner compared with the trans-cranial approach.

## Functional

ePoster presentation

### Bibliometric analysis of Mexican publications on stereotactic and functional neurosurgery from 1949 to 2021

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**Objectives:** To establish the research output of Mexico in terms of Stereotactic and functional neurosurgery (SFN).

**Background:** SFN is a rapidly evolving field and some emerging countries, especially Mexico, have made significant contributions to this discipline. A bibliometric analysis has never been performed in México.

**Methods:** Scopus was queried using keywords pertaining to functional neurosurgery, restricting the affiliation country to Mexico, and considering documents published after 1949. Added to the initial search, a complementary literature exploration by author, considering the publications of the most productive neurosurgeons, was performed. A descriptive statistical analysis was carried out.

**Results:** From 5,109 articles, only 371 were eligible. Scientific production has gradually increased with time. Epilepsy (31%) and movement disorders (27.4%) were the most studied neurological conditions, whereas the other 41.6% corresponded to pain, behavior disorders, spinal cord injuries, neuromodulation, stereotactic biopsies, and SFN history. Level of evidence was predominantly level V (59.1%). Publication output is highly skewed to Mexico City, which represents 78.4% of national production. Relative to factors associated with impact of research, publications in English had more citations (28.5 mean citations per paper), and journals with an impact factor greater than one had more than 10 mean citations per paper.

**Conclusions:** Mexico has experienced an increase in the productivity of SFN literature, addressing the most prevalent issues in the country (epilepsy and motor disorders). However, it is necessary to report studies with a higher level of evidence, as well as to decentralize the research collaborating with national institutions outside Mexico City. On the other hand, it is imperative to promote scientific production in English and in high-impact indexed journals to increase the visibility of our production. We would like to call upon our colleagues in other countries to reproduce our methodology, in order to determine the factors associated with the impact and productivity on SFN research.

## Peripheral

Oral presentation

Does isolated surgical neurolysis continue to be a useful technique for clinical recovery in adult patients with brachial plexus neuropathy?

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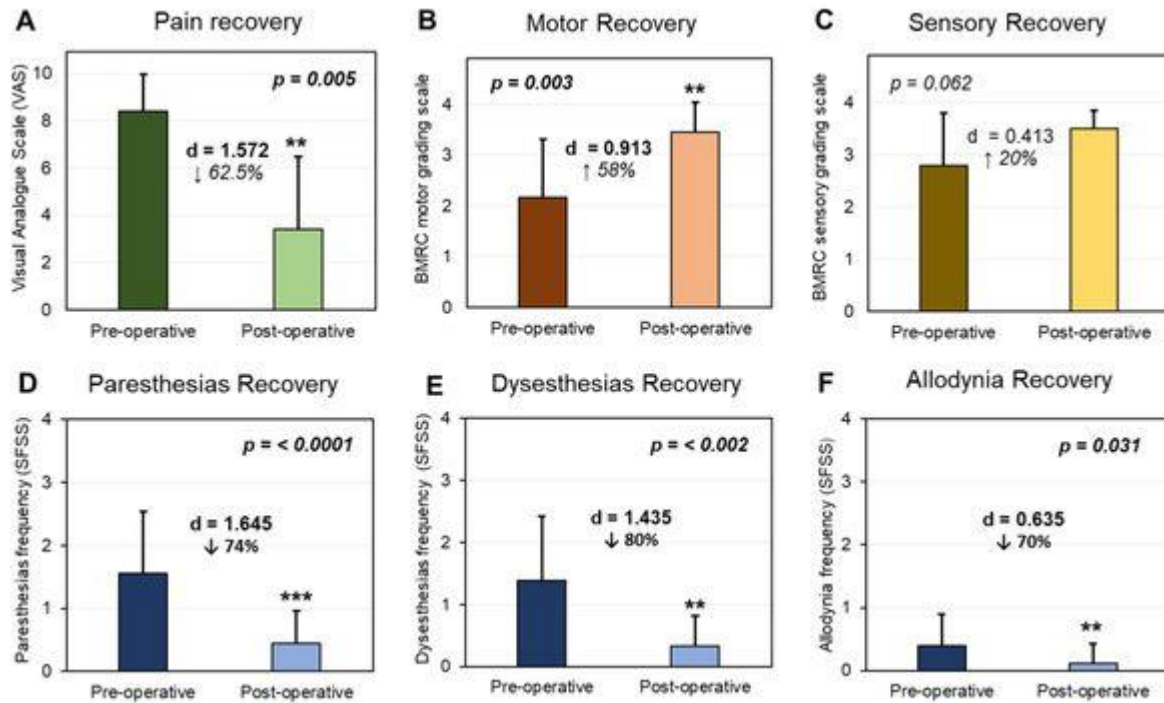
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**Objectives:** To evaluate the usefulness of surgical neurolysis (SN) for neuropathic pain, sensory, motor recovery and positive sensory symptoms (paresthesias, dysesthesias, and allodynia) recovery in patients with brachial plexus neuropathy (BPN).

**Background:** A recent systematic review published by our group that compared different surgeries reveal that SN, a technique displaced by new surgical alternatives, demonstrated the highest proportion of clinical recovery (85.18%,  $p = 0.028$ ).

**Methods:** A compilation of case series of patients with BPN who underwent SN in the General Hospital of Mexico was carried using Visual Analogue Scale (VAS), British Medical Research Council motor/sensory grading scale (BMRC), and Sensory frequency of Symptoms Scale (SFSS) for clinical assessment, added to a literature review.

**Results:** A significant decrease in pain after SN was observed resulting from an average preoperative state according to VAS of  $8.4 \pm 1.58$ , to a postoperative state of  $3.4 \pm 3.27$  (59.52%,  $p = 0.005$ ,  $d = 1.572$ ), added to a mean sensory improvement (25%) from  $2.8 \pm 1.62$  to  $3.5 \pm 0.97$  according to BMRC ( $p=0.062$ ,  $d = 0.413$ ). Intervention showed an increase of 58% in muscle strength according to BMRC, resulting from an average preoperative state of  $2.17 \pm 1.15$  to a postoperative condition of  $3.44 \pm 1.34$ , exhibiting statistically significant changes ( $p = 0.003$ ,  $d = 0.913$ ). Within the positive sensory symptoms, a significant decrease was observed in paresthesias (74%,  $p < 0.0001$ ,  $d = 1.645$ ), dysesthesias (80%,  $p < 0.002$ ,  $d = 1.453$ ), and allodynia (70%,  $p = 0.031$ ,  $d = 0.635$ ) according to SFSS (Figure 1).



**Conclusions:** Both the case series and the literature review demonstrate considerable clinical recovery. Even so, due to the lack of complete clinical trials, these results highlight the need to re-evaluate the usefulness of SN, conducting well-designed, powered, randomized, and blinded trials.

## Hydrocephalus

ePoster presentation

A review of minimally invasive neuroendoscopic procedures conducted in Sarawak General Hospital, Malaysia

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### Objectives:

1. To collect the demographic data of patients who underwent neuroendoscopic procedures in Sarawak General Hospital.
2. To review the outcomes and complications of conducted neuroendoscopic procedures in Sarawak General Hospital.

**Background:** Neuroendoscopy is a blooming field resulting from advanced technologies and trained personnel. The use of a ventriculoscope and ventriculostomy in treating hydrocephalus has become more common.

**Methods:** All neuroendoscopic procedures conducted in the Neurosurgery department of Sarawak General Hospital were included from May 2018 till June 2023. We used Karl Storz neuro-endoscope DECQ and a full HD camera system to perform all the procedures under general anesthesia. The second author was the lead surgeon on the procedures.

**Results:** We have done 23 neuroendoscopy cases in Sarawak General Hospital. There were 16 male and 7 female patients. Their ages range from 2 months old to 42 years old. The cases were predominantly pediatric cases. The majority of the cases were obstructive hydrocephalus secondary to multiple underlying pathologies etc. congenital pathologies, infection related, trauma, tumor and vascular respectively.

There were 12 cases of endoscopic third ventriculostomy, 10 cases of septostomy and 9 cases of endoscopic guided ventricular catheter placement done. There were 2 out of 8 tumor cases benefited from endoscopic tumor biopsy. There were 2 patients who required an endoscopic third ventriculostomy as a second operation due to a sealed ventriculostoma. One patient had postoperative transient mutism and another 3 cases needed a complement shunt despite ventriculostomy.

There were 3 mortalities during this study, one due to tumoral bleeds whereas the other two were due to disease progression. However, there are no procedure related complications.

**Conclusions:** Endoscopic surgery performed has proven to be a very effective technique with many approaches/corridors. The field will benefit from further miniaturization of cameras and optical technology and innovations in surgical instrumentation design.



## Neurovascular Surgery

Oral presentation

The effect of EC-IC bypass on intelligence and cognitive function in patients with chronic cerebrovascular ischemia

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**Objectives:** We present the result of a prospective cohort study to evaluate whether extracranial-intracranial (EC-IC) bypass improves intelligence quotient (IQ) or cognitive function in patients with chronic cerebrovascular ischemia.

**Background:** EC-IC bypass has reduced subsequent cerebral infarction in patients with large cerebral vessel occlusion/severe stenosis who also show decreased cerebral blood flow (CBF) and cerebrovascular reactivity (CVR). However, there has been no consensus on the efficacy of EC-IC bypass in intelligence or cognitive function for these patients.

**Methods:** The patients with chronic cerebral ischemia (excluding moyamoya disease) who underwent EC-IC bypass surgery at our department since 2013 were included in this study. All patients had ICA or MCA occlusion/severe stenosis with reduced CBF (80%< of normal value) and CVR (10%<). We evaluated the pre- and 6-month postoperative intelligence quotient or cognitive function in all patients. We employed an IQ and cognitive assessment battery as follows; Mini-Mental State Examination (MMSE), Wechsler Adult Intelligence Scale (WAIS)-III, trail-making test (TMT), Stroop test, Rey Auditory Verbal Learning Test (RAVLT), and Benton Visual Retention Test (BVRT). We evaluated preoperative and 6-month changes in the assessment battery and patient background factors related to the changes.

**Results:** Sixty-one patients with chronic cerebral ischemia were evaluated for IQ and cognitive function before and 6 months after EC-IC bypass. The mean age of the patients was 64.1 ( $\pm$ 13.7) years, 38 (62.2%) were male, and 25 (41.0%) were left-sided surgery. WAIS-III ( $p$ <0.001) and AVLT ( $P$ =0.02) showed significant improvement 6 months after surgery compared to preoperative assessment, especially motor IQ in the WAIS-III. In addition, there was a tendency that the lower the preoperative IQ, the greater postoperative improvement.

**Conclusions:** EC-IC bypass for patients with chronic cerebral ischemia improves 6-month IQ and cognitive function, especially in patients with low preoperative IQ.

## Education, Ethics, Socioeconomic

ePoster presentation

Jesus Prayers applied in separation of craniopagus twins  
(Medical innovation and distress elimination by contemplation)

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**Objectives:** There is considerable literature on the harmful effects of distress in medically critical situations. There is just as much literature available on psychological methods aimed at relieving stress. One can make creative and fast decisions without stress much more effectively. We will discuss these acute decisions and investigate them with a scientific approach, attempting to judge the propriety of decisions made in emergencies by medical personnel. We will investigate the results of our contemplative approach to this phenomenon through concrete examples.

**Background:** Deliberate practice of contemplative behavior daily gives one the ability to quickly retrieve the learned approach, previously studied and experienced in contemplative behavioral practice, during a given procedure. Once the information is retrieved regarding a certain procedure, it can be synthesized with the situation at hand, which allows for the formulation of an enhanced creative option that may increase the possibility of a successful procedure. Thus, the procedure together with the application of the contemplative approach could be acknowledged as a real innovative treatment after gaining scientific approval.

**Methods:** This presentation gives an account of the application of the practiced contemplative approach during a craniopagus, resulting in the success of the procedure.

**Results:** The presentation gives an account of three different neurosurgical innovations that were possible with the application of the contemplative approach. These innovations eventually gained wide recognition, applied by many, leading to progress in neurosurgical challenges not conquerable before. The case study we investigate was the separation of a craniopagus in which the engraved spiritual algorithms of the stress-distress situation there because of contemplative practice led to the innovation of surgical techniques responsible for the success of the procedure.

**Conclusions:**

Ensuring the presence of spirituality during the mindful contemplation of procedures results in professional success of emergencies, demonstrated in the case of the neurosurgical separation of a craniopagus.



## Skull Base

Oral presentation

### Key hole approach to anterior circulation aneurysm clipping

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**Objectives:** To report a single surgeon's experience of multiple keyhole approaches to these aneurysms, highlight the case selection algorithm, technical nuances, and surgical results.

**Background:** Despite a recent surge in keyhole approaches for aneurysm clipping, few studies have compared these approaches, and none have laid any foundation or roadmap for surgeons newly venturing into these procedures.

**Methods:** 24 patients (25 aneurysms) underwent aneurysm clipping using either a minipterional approach (MPA) or lateral supraorbital approach (LSO) or a supraorbital keyhole approach (SOKHA). Intraoperative premature rupture, adequacy of clipping, and immediate postoperative and long-term functional outcomes was recorded.

**Results:** All but 5 patients presented with ruptured aneurysms (Hunt and Hess grades 1 in 12 patients, grade 2 in 5 patients and 3 in 2 patients). The anterior communicating artery (A-Comm, n=14, 56%) was most frequently involved with aneurysms. The MPA was most frequently employed (n=11, 45.8%), followed by the LSO (n=9, 37.5%) and the SOKHA (n=4, 16.7%) respectively. An intraoperative rupture (total n=5, 20.8%) was most frequently seen in the SOKHA group (50%) and the only case of inadequate aneurysm clipping resulted from inadequate clipping ergonomics during the SOKHA for A-Comm aneurysm. Major complications occurred in supraorbital approaches (one each in LSO and SOKHA). Irrespective of the approach used, the long-term outcomes were excellent.

**Conclusions:** In properly selected patients, key-hole approaches, particularly MPA and LSO, can provide excellent surgical outcomes. The learning curve with SOKHA is steeper. A pragmatic case selection algorithm is proposed.

## Global Neurosurgery

Oral presentation

### Setting up an intraoperative neurophysiology service in Myanmar

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**Objectives:** Our goal was to set up the first intraoperative neurophysiological monitoring (IONM) service in the country – applying the concept of low costs, simple equipment and highly trained staff.

**Background:** Specialties such as neurosurgery have just started to be developed in Myanmar. As neurosurgical operations become more complex, there is an increasing need to guide those surgeries.

**Methods:** A progressive training plan was established. Supported by a travel grant, a neurologist and two technicians travelled to Switzerland for fellowship training in IONM for 6 months. The team from the hosting IONM center then performed the initial IONM surgeries together with the trainees back in Myanmar. The next step was for the Myanmar team to execute diverse surgeries in a progressively independent way incorporating IONM, which were supervised remotely by the training center.

**Results:** From 2018–2022, 85 adults and 15 pediatric IONM surgeries were performed in two Yangon hospitals. Half of the surgeries (52%) were infratentorial (cerebello-pontine angle and other complex skull-base tumors, posterior fossa and 4th ventricle tumors). A quarter (25%) of the patients underwent intradural spine surgeries including lipomeningocele and intramedullary spinal cord tumors. The remaining patients (23%) were operated on supratentorial tumors (mostly glioma). The successfully applied IONM techniques were motor-evoked potential monitoring – transcranial and direct cortical stimulated – as well as somatosensory evoked potential monitoring. Further techniques used, depending on the surgical case, were cranial nerve and spinal nerve root stimulation, and subcortical motor mapping. Minor or major IONM alerts were given in 98% of cases and led to modification of the surgical strategy in all cases.

**Conclusions:** Applying a step-by-step approach comprising education and supervision enabled an independent IONM service to be implemented in Myanmar. This example could guide similar programs in other centers. Continuous training and support is essential to guarantee up-to date quality.

## Functional

Oral presentation

### First experiences with DBS IPG replacement using a hybrid system

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**Objectives:** To evaluate safety and efficacy of hybrid systems for DBS IPG replacement.

**Background:** Until recently DBS systems did not allow cross-over devices, switching with the IPG from one system to another during replacement procedures. Since 2022 an adapter for switching from conventional Medtronic DBS systems is available (Boston Scientific M8 ). It allows for connection to Medtronic extensions and leads.

**Methods:** We hereby report on first experiences using this system regarding programming safety related to the conversion from precursor single-source IPGs to Multiple Independent Current Control (MICC) IPGs. Intra and postoperative complications were assessed as well as adverse effects following conversion. The rationale for switching were patient's preference, limited longevity (< 3 year battery life), smaller size option, limitations due to side effects with the prior system. The average IPG longevity prior to conversion: 2.7 y (0.9 – 4.8).

**Results:** We evaluated the differences in stimulation parameters until the last recent visit.

11 consecutive PD, DYS and ET patients underwent IPG hybrid devices at our University hospital. All patients were considered preoperatively by our interdisciplinary Movement disorder board (Movement disorder specialist unit and functional neurosurgeons). Of the 11 patients, there were 6 male and 5 females, STN n=5, GPI n=3, VIM n=2, VIM/ANT n=1. No surgical complications occurred. All patients were switched to the MICC setting the next day after surgery. Out of the total of 11 patients, 7 reported a status idem, 4 improved in at least one symptom or adverse event at the first post op visit. All patients received > 2 active electrodes. 7 (out of 11) of the patients in the multi visit subgroup received > 2 active electrodes.

**Conclusions:** Using hybrid systems for DBS IPG replacements has found to be safe and feasible, especially regarding surgical experience. Improved patient experience with small IPGs and low charge burden.

## Global Neurosurgery

ePoster presentation

### Exoscopes, a new dimension in neurosurgery?

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**Objectives:** Are exoscopes already a replacement for the operating microscope in Neurosurgery.

**Background:** In the last couple of years several different exoscopes emerged on the market. We tested 4 different systems on the market to see if time has come to replace our operating microscope with an exoscope.

**Methods:** We tested 4 different Exoscopes on the market. Each exoscope was tested in the lab and in the operating room. The systems were several weeks for testing at our department. We compared the exscopes to each other and also to the operating microscope.

**Results:** The 4 tested exoscope, were the Roboticscope by BHS, the AEOS by Aesculap, the VITIM by Storm and the Orbyeye by Olympus. The exoscopes have a couple of common features, and every systems has its own features. Compared to the operating microscope all exscopes are a fully digital Systems with a digital picture processing and all of them have an LED lightsoure. All exscopes use monitors to display the image. The Roboticscope uses a Helmet Mounted System with 2 screens to generate a 3D image, all other systems use an external monitor und 3 D glasses to produce a 3D image. There are also differences in how the system are controlled. Roboticscope and AEOS use a robotic arm to control the exscope. Vitom is a manual controlled system and the Orebeye is a semi robotic system. With all Exscopes the visualisation was excellent, the usability was different throughout the exscopes. Also the features of the systems were quite different. The Roboticscope did not have any additional features, whereas Orbyeye and AEOS have fluorescene imaging for vascular and tumor surgery build in.

**Conclusions:** After testing several Exoscopes and finally switching from the operating Microscope to an Exoscope , we are convinced that Exoscopes will replace operating Microscopes in the future.

## Spine

Oral presentation

### Neurologic complications and risk factors for motor weakness following oblique lumbar interbody fusion

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**Objectives:** This study aimed to report the incidence and potential risk factors for neurologic complications and especially motor weakness following OLIF.

**Background:** Oblique lumbar interbody fusion (OLIF) is known as a minimally invasive technique for disc space fusion which protects the intrapsoas nerves. Nevertheless, neurologic complications and motor weakness after OLIF has been known to occur in some cases.

**Methods:** We enrolled 38 patients and 59 segments who underwent OLIF. Computed tomography was performed before and after OLIF. Radiologic data including psoas muscle (cross-sectional area, Hounsfield unit (HU), fat portion grade), bone mineral density and clinical data, including age, sex, presenting symptoms, visual analog scale score, operating segments, and postoperative complications, were collected. We divided the patients into groups with and without neurologic deficit. Transient deficits were considered as such up to 1 month after surgery. Neurologic status was evaluated preoperatively and postoperatively at 2 days, 1 week, 1 month, and 3 months. Number of levels, disc height, foramen height and osteophyte length were measured and compared between the 2 groups.

**Results:** The neurologic deficit group included 4 patients with transient (10%) and 2 (5%) patients with permanent weakness, whereas non-neurologic deficit group included 35 patients (85%). The neurologic deficit group included 10 segments (8%), whereas the non-neurologic deficit group included 114 segments (92%). The disc and foramen heights did not differ significantly between the groups with and without neurologic deficit; however, the psoas retraction time, osteophyte lengths and multilevel surgery more than 3 levels were higher in the neurologic deficit group.

**Conclusions:** In our study, psoas retraction time, osteophyte lengths and multilevel surgery were found to be potential risk factors for motor weakness after OLIF. For patients with severe multilevel degeneration with long osteophytes may have neurologic complications and show delayed recovery from postoperative weakness.

## Oncology

Oral presentation

### Pre-operative Stereotactic Radiosurgery (SRS) for brain metastases: a prospective observational study

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**Objectives:** To determine the feasibility of preoperative radiosurgery for brain metastases in our institution. To assess the outcomes for patients receiving pre-operative SRS for brain metastasis. Primary outcomes being radiation necrosis and leptomeningeal disease. Secondary outcomes being local control, overall survival, toxicity, time to systemic therapy and rate of non completion of treatment.

**Background:** The addition of postoperative SRS to resected brain metastases provides greater local control of metastases but there are issues delivering it postoperatively. The cavity volume is hard to delineate, 20% of patients don't go on to adjuvant radiation or have delays in the initiation of systemic therapy. There is evidence for preoperative SRS reducing radiation necrosis and leptomeningeal disease.

**Methods:** 24 patients over the age of 18 years with a confirmed cancer diagnosis, no previous cranial treatment, with a total of 25 metastases sized 2-5 cm were selected from our MDT. Gross total resection was reasonably expected and no emergency intervention was required.

**Results:** Melanoma and non small cell lung cancer formed 71% in total of pathologies with colorectal and breast 8% and other pathology 1.3%. There was zero percent radiation necrosis that was either radiological or clinical, 4% leptomeningeal disease, 92% local control at 6 months and 67% overall survival at one year. 100% completed their local treatment. The median length of stay for radiation and surgery was 3 days and the interval between SRS +surgery and systemic therapy 22 days. There were no wound complications.

**Conclusions:** Preoperative SRS confers a high rate of local control, reduced leptomeningeal disease and radiation necrosis. It has low risk of acute toxicities and wound complications. It enables prompt initiation of systemic therapies and improved patient compliance with timely sequenced treatment in comparison to postoperative SRS.

## Oncology

ePoster presentation

### Microsurgical treatment of craniopharyngiomas: a 20-year clinical follow-up study

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**Objectives:** To retrospectively observe 19 patients with craniopharyngiomas (CPs) after aggressive microsurgical treatment using a more than 20-year follow up period.

**Background:** Transcranial surgery remained a mainstay for CP.

**Methods:** A more than 20-year follow-up was obtained in 19 (10.2%) of 187 patients with aggressive transcranial surgical treatment of CP. All patients were followed up by using a written patient questionnaire and the quality of life was assessed with both the Karnofsky Performance Score (KPS) and the SF-36 questionnaire.

**Results:** Among 19 patients, one surgery was performed in 13 (68.4%) patients, a second surgical treatment was performed in 4 (21.1%) patients, and three and four surgeries were performed in each patient (10.5%). Eighteen patients were tumor free, and one patient survived with the tumor for two years. KPS 100 scales were used to assess 16 patients (84.3%), KPS 90 scales were used in 2 patients (10.5%), and KPS 80 scales were used in 1 patient (5.2%) who needed hormone substitute therapy. The Short-Form 36 subscale summaries revealed scales of  $88.03 \pm 27.94$  for the physical components of health status and scales of  $80.49 \pm 22.54$  for the mental components of health status. The time durations until tumor recurrence were 3 and 14 years (mean,  $5.86 \pm 4.50$  years) following the third and fourth surgeries, respectively. Comparison of the times until developing recurrent tumors in the patients with a second surgery or a third and fourth surgery showed no significant difference ( $t=0.775$ ,  $P>0.1$ ).

**Conclusions:** A long-term tumor-free outcome was achieved through transcranial surgery, without limitations for each individual tumor with distinct features, and surgery had an effect on the survival and prognosis. However, some patients still had problems with their hypothalamic function.

## Neurovascular Surgery

Oral presentation

Management of complex intracranial aneurysms with bypass surgery: a series of 157 patients

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**Objectives:** Despite advances in microsurgery and the development of new endovascular techniques, the treatment of complex intracranial aneurysms remains a daunting challenge for neurosurgeons.

**Background:** We retrospectively reviewed our experience of bypass surgery in the treatment of 157 cases of complex intracranial aneurysms between April 2004 and July 2022.

**Methods:** Internal maxillary artery as donor with radial artery was used in 106 cases, external carotid artery with saphenous vein (SV) grafts in 18 cases, occipital artery (OA) in 8 cases, and cranial-Intracranial bypass with Interposition graft in 11 cases, while the remaining 14 cases were managed with superficial temporal artery (STA) grafts.

**Results:** In this series, the aneurysms were excised in 63 cases, proximal occluded in 48 cases and trapped in 46 cases. Postoperative angiographies were performed in 148 patients were observed with postoperative angiographies. The patency of the bypass graft and obliteration of the aneurysms were confirmed in 139 (93.9%) patients. Patency of the bypass could not be confirmed in the remaining 9 (6.1%) patients, of which three patients compromised cerebral infarction due to graft occlusion, and the other remained asymptomatic. Within 1 month after surgery, 139 (90.3%) patients had good outcome, 9 (5.8%) patients needed assistance for daily living, and 6(3.9%) deaths occurred due to brainstem infarction in 3 patients and deep vein thrombosis 3 patients. In 128 patients with a mean follow-up of 3.0 years, 119 (93.0%) patients had good outcome, 6(4.7%) patients needed assistance for daily living, and 3 (2.3%) death occurred unrelated to surgery.

**Conclusions:** Proper use of bypass surgery is imperative in preserving the parent artery and its major perforators. The internal maxillary artery, used as a donor in a bypass, is an effective method due to its shorter distance from the recipient vessels and relatively large diameter with resulting higher flow rate



## Skull Base

ePoster presentation

Micro-neurosurgical resection of spheno-orbital meningioma with customized orbit reconstruction technique

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**Objectives:** NA

**Background:** Spheno-orbital meningioma (SOM) is a rare intracranial pathology with intraosseous hypertrophy and intraorbital extension.

**Methods:** We described a mid-aged female with SOM was managed in a micro-neurosurgical manner. The titanium implant was customized and applied to rebuild orbital wall for preventing postoperative enophthalmus.

**Results:** NA

**Conclusions:** Despite technical demanding, favorable cosmetic, clinical outcomes without complications can be achieved by meticulous surgical technique following radical resection.

## Neurovascular Surgery

ePoster presentation

### Endoscopic clipping of anterior communicating artery aneurysms

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**Objectives:** To demonstrate the feasibility of endoscopic anterior communicating artery aneurysms via a supraorbital keyhole approach.

**Background:** Anterior communicating artery aneurysms are most prone to rupture. Surgically, they are conventionally being managed by a pterional approach. Some neurosurgeons prefer a supraorbital keyhole approach in select cases. Fully endoscopic clipping of such aneurysms is seldom described.

**Methods:** We clipped eight anterior communicating artery aneurysms endoscopically via a supraorbital keyhole approach. Their presentation, imaging and surgical nuances are discussed.

**Results:** There were six females and two males. All patients were in middle age. All patients presented with acute subarachnoid haemorrhage. The presentation WFNS grade was I in five patients, while it was two in three patients. There were five superiorly directed aneurysms, two anteriorly directed aneurysms, and one inferiorly directed aneurysm. All aneurysms were clipped via a supraorbital keyhole approach (via the right sides in five and the left sides in three patients). There was one intraoperative aneurysmal rupture. The intraoperative aneurysmal rupture was also managed endoscopically. One patient developed immediate postoperative myocardial infarction and died. Of seven surviving patients, one patient developed ipsilateral caudate nucleus infarction. She remained dull for nearly two weeks and then improved. One patient developed a lacunar infarct in the posterior limb of the internal capsule resulting in transient lower limb weakness that improved over the next week. Five patients developed postoperative vasospasm managed with nimodipine and intraarterial vasodilators. None of the patients developed postoperative hydrocephalus. Seven out of eight patients could make an excellent postoperative recovery. At the final follow-up, none of the patients developed any significant motor deficit. The cosmetic outcome was satisfactory.

**Conclusions:** Select cases of anterior communicating artery aneurysms can be clipped endoscopically using standard instruments and adhering to the basic principles of aneurysm clipping.

## Hydrocephalus

Oral presentation

### Extra axial endoscopic third ventriculostomy

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**Objectives:** To demonstrate the efficacy of the extra-axial approach of endoscopic third ventriculostomy for the management of obstructive hydrocephalus.

**Background:** Most of the ETV complications are inherent to the procedure's intra-axial nature. An alternative extra-axial route can overcome these inherent issues attributed to conventional ETV.

**Methods:** Extra axial ETV (EAETV) via mini supraorbital craniotomy, the sub-frontal approach, was done on patients requiring CSF diversion due to tri-ventricular hydrocephalus and slit ventricle syndrome. The lamina terminalis was fenestrated for ventriculostomy. The preoperative parameters - aetiology, symptoms, Evan's index, Frontal occipital horn ratio and third ventricle index were recorded. The postoperative evaluation included clinical (mRS) and radiological assessment with a CT scan and cine phase-contrast MRI. The preoperative and postoperative parameters were compared statistically.

**Results:** Out of 46 patients, 45 had hydrocephalus, and one had slit ventricle syndrome. After extra-axial ETV, all patients showed clinical and radiological improvement. The mRS of 0-1 was achieved in all patients except in a patient with tectal tuberculoma. There was a significant reduction in Evan's Index, Frontal occipital horn ratio, and Third ventricle index after extra-axial ETV ( $p < 0.05$ ) for hydrocephalus. The ventricular indices were normalised in cases of acute hydrocephalus. In patients with chronic hydrocephalus, ventricular indices were improved but not normalised. A patient with symptomatic slit ventricle syndrome improved. The CSF flow voids across the stoma were appreciable in all cases. No serious complications were encountered. The follow-up duration ranged from 1-18 months.

**Conclusions:** Extra axial ETV is a feasible, safe and effective surgical alternative to conventional ETV.

## Epilepsy

Oral presentation

GABAergic interneuron cell therapy for mesial temporal lobe epilepsy: non-human primate implants and early results from a first-in-human trial

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**Objectives:** This pre-clinical and clinical study is investigating whether one-time implantation of human GABAergic interneurons derived from allogeneic human stem cells (NRTX-1001) can lead to seizure control in drug-resistant mesial temporal lobe epilepsy (MTLE).

**Background:** It is known that implantation of human cortical-type GABAergic interneurons in the hippocampus of mice with kainate-induced mesiotemporal sclerosis can control focal seizures (Priest et al., 2021). This study extends these results to a series of NRTX-1001 implants in non-human primates and some early findings in a first-in-human Phase I/II clinical trial.

**Methods:** This report details the results with image-guided stereotactic implantation of NRTX-1001 in non-human primates (*M. mulata*) and the initial results of a first-in-human Phase I/II clinical trial (NCT05135091). Human subjects had unilateral mesial temporal lobe epilepsy (MTLE) with hippocampal sclerosis and focal seizures refractory to drug treatment. Cells were implanted via image-guided stereotactic injection along the long axis of the hippocampus with intra-operative MRI imaging. The primary endpoint for the on-going human trial is safety, and the secondary endpoint is seizure frequency at 1-year post-implant.

**Results:** Histologic data from the NHP study confirmed the accuracy of graft placement in the hippocampus with cellular migration and incorporation of the NRTX-1001 GABAergic interneurons into and around the dentate gyrus. Data on the human trial are reported as of 01May2023. The first OHSU subject is 7 months out from dosing and has had a >90% seizure reduction to date.

**Conclusions:** This study of NRTX-1001 cell therapy demonstrated the procedure of image-guided stereotactic cell implantation was anatomically accurate in both NHP and human brain, that these cells are incorporated into the hippocampus. Preliminary results of the first-in-human study of GABAergic interneurons for focal epilepsy are encouraging. One-time implantation of NRTX-1001 cells offers the potential for seizure control in patients with MTLE without removal or ablation of brain tissue.

## Functional

Oral presentation

### Successful management of refractory craniofacial pain with peripheral nerve field stimulation: a multicenter case series

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**Objectives:** The objective of this study is to investigate and compare the safety and effectiveness of PNFS for a variety of CPS across two medical centers in Australia and United States.

**Background:** Craniofacial pain syndromes (CPS) affect up to a quarter of the population worldwide and encompass various debilitating etiologies including migraine, cluster headaches, trigeminal neuralgia (TN), and atypical facial pain. Medical management is initially indicated but some patients eventually require surgical intervention. Peripheral Nerve Field Stimulation (PNFS) is a novel method for managing refractory CPS.

**Methods:** Twenty-one adult patients with refractory CPS, classified using the International Classification of Headache Disorders-3<sup>rd</sup> Edition, underwent PNFS between 2017 and 2022 in one Australian and one American health care system. Pain severity using the Barrow Neurological Institute Pain Intensity Score was retrospectively analyzed at baseline, 2-weeks, 6-months and 12-months post-implantation. Operative complications and time to reintervention are reported.

**Results:** Average baseline BNI of all patients was 5, which significantly improved to 2.15 (SD=1.8;  $t(19)=-11.461$ ,  $p<0.001$ ) at 2-weeks postoperative, and was on average sustained throughout the 12-months follow-up ( $t(11)=-7.746$ ,  $p<0.001$ ). The most consistent pain relief was observed among patients with idiopathic type trigeminal neuralgia and trigeminal neuropathy. Patients with classic TN had an overall poor response. Complications included infection in 2 patients and refractory pain in 5 patients requiring re-intervention at an average of 24 months post-operatively.

**Conclusions:** PNFS for CPS refractory to traditional medical and surgical management can be effective. Different etiologies of CPS as well as PNFS devices may explain the variability in long-term outcomes. Improvement in PNFS technology and optimization of pulse settings allows refractory CPS to be treated efficiently for well-selected patients.

## Neurovascular Surgery

ePoster presentation

### STA-MCA bypass for symptomatic Moyamoya disease – lessons learnt from 89 revascularisations

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**Objectives:** To comprehensively evaluate clinical and angiographic outcome in symptomatic Moyamoya-disease (MMD) patients undergoing STA-MCA bypass.

**Background:** Efficacy of surgical revascularisation procedures over conservative management in moyamoya disease (MMD) has been established in the past. However there is dearth of literature on comprehensive evaluation of impact of age and Suzuki staging on clinical and angiographic outcome in symptomatic MMD patients undergoing direct revascularisation (DR) via superficial temporal artery – middle cerebral artery (STA-MCA) bypass.

**Methods:** We analysed consecutive MMD patients who underwent direct-revascularisation (DR) via STA-MCA bypass. Primary outcome measures were mRS scale and stroke risk reduction. Secondary outcome measure was angiographic outcome score (AOS).

**Results:** 70 patients (89 DR procedures), including 37.9% adults (>18yr), were operated over a duration of 8 years and followed up for 2 years (mean). Long-term bypass-patency rates were deemed 83.3% and 88.8% in children and adults respectively. In pediatric age group, median mRS scores improved from 3 to 2 (p=0.001), 97.3% were free of recurrent strokes and AOS scores improved significantly (p=0.002). Amongst adult MMD patients, median mRS score marginally improved from 3 to 2 (p=0.25), 100% were free of recurrent strokes and AOS improved significantly (p=0.02). On comparing pediatric and adult patients, improvement in mRS scores (p=0.14) and AOS scores (p=0.65) were similar across the two age groups. Overall late stage MMD patients (Suzuki stages IV-VI) showed better improvement in mRS scores when compared with early stage MMD patients (Suzuki stages I-III; p=0.04). Recurrent stroke rates were similar in both groups (p=0.26). AOS scores improved significantly in both early and late stage MMD (p<0.001 in both), though the improvement amongst the two groups was similar (p=0.88).

**Conclusions:** Using meticulous surgical technique, excellent long-term bypass patency rates can be achieved to facilitate optimal clinical and angiographic outcome in symptomatic MMD patients, irrespective of the age group and stage of disease.

## Functional

Oral presentation

Genetic polymorphisms in patients with trigeminal neuralgia: genomic associations based on age, gender, and pain with and without neurovascular compression

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**Objectives:** To determine any genomic associations with the development of Trigeminal Neuralgia (TN).

**Background:** Neurovascular compression (NVC) is one possible etiology of this condition, but by no means is it the only predisposing feature. In fact, trigeminal NVC is so common in the general population as to be almost 100% asymptomatic. Younger patients, almost exclusively female do not have NVC as a basis for TN.

**Methods:** This study was conducted in eight centers: six in the US, one in Canada, and one in England. Patients had well-characterized Classic TN (TN1). A total of 781 saliva samples were collected. From this group, 299 patients were reported to have TN1, with or without NVC by MRI. 227 had evidence of NVC (TN-WNVC) on imaging and 72 did not have NVC (TN-WONVC). The genetic results of this cohort were compared to 827 non-TN controls. Samples were analyzed by genome wide association studies (GWAS) and whole genome sequencing (WGS).

**Results:** In TN-WNVC patients there was a strong association of the KCNK10 SNP gene allele frequency in comparison to TN-WONVC patients, and controls. In TN-WONVC, the strongest associations in the SNP allele frequencies were in the LRP1B gene in comparison to controls. In this gene there was also significant difference in allele frequency in TN-WNVC in comparison to controls. Centromeric SNPs also were highly associated with both TN-WONVC and TN-WNVC in comparison to controls. Weaker associations for two other genes, TENM3 and LINC00290, were also found in comparison to controls.

**Conclusions:** These findings add to the mounting evidence that TN is a phenotype. Genetic variation appears to predispose to the development of TN, and may be, at least in part, responsible for TN. TN appears to be an entity that stems from multiple pathophysiologic mechanisms. Neurovascular compression appears to play an important, but not essential, role in its development.

## Functional

Oral presentation

### Successful management of Trigeminal Neuralgia (TN)-related facial pain syndromes with Stereotactic Radiation Surgery (SRS): a case series

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**Objectives:** This case series investigates the safety, efficacy, and durability of SRS for TN-related facial pain syndromes.

**Background:** TN-related facial pain syndromes can be classified as idiopathic, spontaneous facial pain that is episodic (TN 1) or constant (TN 2); trigeminal neuropathic pain from injury; TN secondary to multiple sclerosis (MS); postherpetic TN following a cutaneous herpes zoster outbreak or atypical facial pain secondary to a somatoform pain disorder.

**Methods:** This is a retrospective case series of 192 patients with TN-related facial pain syndromes who underwent SRS between 2015 and 2022 at Princess Alexandra Hospital, Queensland, Australia. Demographics, etiologies of facial pain syndromes and prior treatments were correlated with pain severity post-SRS using the Barrow Neurological Institute Score (BNI) as well as time to best response and relapse. Results were statistically evaluated with Kaplan-Meier analysis and Cox proportional hazards regression.

**Results:** Whilst time to best response from SRS was shortest amongst MS-related TN patients at 3.83 weeks and longest amongst postherpetic TN patients at 8.67 weeks, differences were not statistically significant (p 0.584). Differences in time to relapse based on facial pain etiology (p 0.027), type (p 0.00) and prior treatments (p 0.003) were significant. Complications occurred in 22.4% of patients, most common being numbness in the trigeminal nerve distribution.

**Conclusions:** This case series demonstrates utility of SRS for various types of TN-related facial pain syndromes. Whilst the most rapid response occurred in patients with MS-related TN, the most durable response occurred amongst patients with an underlying vascular cause as well as type 1 TN. Prior SRS also increases the chance of good response.



## Functional

ePoster presentation

### Successful management of tremors with Stereotactic Radiation Surgery (SRS): a case series

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**Objectives:** This study investigates the safety and efficacy of SRS for tremors related to various etiologies.

**Background:** Tremor is a prevalent debilitating movement disorder that can be refractory to medical and surgical treatments.

**Methods:** This is a retrospective case series of 38 patients with essential tremor, dystonic tremor, tremor-dominant Parkinson's disease (PD), tremor secondary to PD and tremor secondary to Multiple Sclerosis who underwent SRS between 2018 and 2022 at Princess Alexandra Hospital, Queensland, Australia. Demographics, etiologies of tremors, radiation treatment dose and targets were correlated with response to SRS. Responses were recorded based on tremor rating scales including the Essential Tremor Rating Assessment Scale (TETRAS) as well as the Quality of life in Essential Tremor Questionnaire (QUEST). Results were then summarized into categories i.e. worse, no improvement, mild (up to 30% improvement), moderate (31-70% improvement) and excellent improvement (>71% improvement). Results were statistically evaluated with ANOVA tests of variance.

**Results:** All patients underwent SRS targeting the ventral intermediate nucleus of the thalamus. Differences in outcomes were significant based on etiology of tremors (p 0.0003) as well as radiation dose administered (p 0.0007). Overall, 63.2% of patients improved, 23.7% had no improvement and 13.1% were mildly worse. Patients who underwent radiation at 130Gy had the best response whereas 120Gy radiation resulted in the worst response. Highest recurrence rate occurred in patients with tremor-dominant PD and patients who underwent radiation at 125Gy. Overall recurrence rate was 13% with a median time to recurrence of 8 months. Complication rate was 13.1% including two minor hemiparesis, one cerebral oedema and two new-onset tremors.

**Conclusions:** SRS is a beneficial minimally invasive treatment strategy for patients with tremor with minor side effects.

## Neurovascular Surgery

ePoster presentation

### Radiographic scores in subarachnoid hemorrhage: a comparison of predictive value

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**Objectives:** In this study we aimed to analyse the clinical value of different radiographic scores for prognostication of SAH outcome.

**Background:** Aneurysmal subarachnoid hemorrhage (SAH) is characterized by high morbidity and mortality resulting from the initial severity and subsequent complications during SAH. Multiple scores were developed to predict these risks.

**Methods:** Initial computed tomography scans ( $\leq 48$ h after ictus) of 745 aSAH cases treated between 01/2003 and 06/2016 were reviewed for the SEBES, Claassen, BNI, Hijdra, original Graeb and Fisher scales. Primary endpoints were development of delayed cerebral ischemia (DCI), in-hospital mortality and unfavorable outcome (modified Rankin scale score  $> 3$ ) at 6 months after SAH. Secondary endpoints included different complications during aSAH. Clinically relevant cut-offs were defined using receiver operating characteristic (ROC) curves. Radiographic scores with the highest values for the area under the curve (AUC) were included in the final multivariate analysis.

**Results:** The Hijdra sum score had the most accurate predictive value and independent associations with all primary endpoints: DCI (AUC=0.678, aOR=2.83,  $p < 0.0001$ ); in-hospital mortality (AUC=0.704, aOR=2.83,  $p < 0.0001$ ) and unfavorable outcome (AUC=0.726, aOR=2.91,  $p < 0.0001$ ). Multivariate analyses confirmed independent predictive value of the radiographic scales for risk of decompressive craniectomy (SEBES & Fisher), cerebral vasospasm (SEBES, BNI & Fisher) and shunt dependency (Hijdra ventricle score & Fisher) after aSAH.

**Conclusions:** Initial radiographic severity of aSAH was independently associated with occurrence of different complications during aSAH and its final outcome. The Hijdra sum score showed highest diagnostic accuracy and robust predictive value for early detection of risk of DCI, in-hospital mortality and unfavorable outcome after aSAH.

## Global Neurosurgery

ePoster presentation

### Candida parapsilosis intracerebral abscess and intralesional Amphotericin B: a novel treatment approach to a rare infection

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**Objectives:** To report on a patient with an intracerebral abscess secondary to *Candida parapsilosis* who was treated with intralesional Amphotericin B.

**Background:** Fungal infections are rare but known etiological agents of intracerebral abscesses usually occurring in immunocompromised individuals. *Candida parapsilosis* has been implicated in central nervous system (CNS) infections (i.e. meningitis or ventriculitis) but not been reported to cause intracerebral abscesses. CNS infections secondary to *Candida parapsilosis* are notoriously difficult to treat due to the poor penetration of amphotericin B. Historically, intraventricular amphotericin B has been used to treat *Candida parapsilosis* ventriculitis.<sup>1,2,3,4</sup>

**Methods:** A retrospective review of the patient's notes was performed and a case study written up.

**Results:** A 15-year-old female with no comorbidities presented with non-resolving headaches, photophobia, fevers and meningism. Lumbar puncture was suggestive of bacterial meningitis and she was treated with ceftriaxone. The patient's poor response prompted a CT brain which revealed an early right frontal abscess and frontal sinusitis complicated by superior sagittal sinus thrombosis. After frontal sinus trephination, multiple drainage surgeries and adequate antimicrobial therapy, patient's symptoms persisted with infective markers not improving with subsequent CTs showing re-accumulating of her abscess. *Candida parapsilosis* was cultured, and the patient initiated on micafungin intravenous therapy, which proved ineffective. The patient was taken back to theatre where an external ventricular drain was placed within the abscess cavity- with successful placement confirmed on post-operative imaging. Pus was aspirated with subsequent instillation of intralesional amphotericin B twice a day for two weeks. Patient improved substantially with complete resolution of symptoms, infective markers and radiological features of the abscess. Follow up revealed absence of symptoms and image characteristics of abscess on CT three months post treatment.

**Conclusions:** Intralesional amphotericin B is a novel but effective treatment of *Candida parapsilosis* intracerebral abscess: an organism not previously known to cause intracerebral abscesses.

## Paediatric

ePoster presentation

### A novel posterior interhemispheric subcallosal approach to pineal region tumors

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**Objectives:** In this study, we describe a novel surgical technique and evaluate its safety and efficacy.

**Background:** Optimal management decisions of pineal region tumors depend on the tumor pathology, for benign pineal tumors complete resection is the procedure of choice and for malignant tumors radical resection is controversial. surgical excision for pineal region is challenging operation due to its anatomical location. different surgical techniques have been developed to manage such location. In this study, we describe a novel surgical technique and evaluate its safety and efficacy.

**Methods:** Seven cases with pineal region tumors were operated upon in children's cancer hospital Egypt between 2018 and 2022. The extent of resection, clinical outcome and complications were retrospectively reviewed to evaluate the posterior interhemispheric subcallosal approach without incision the falx or the tentorium cerebelli.

**Results:** Gross total excision was achieved in 4 cases (57.1%), near total in two cases and subtotal in one case. No venous infarction developed either radiological or clinical in any of the cases. No permanent complications were encountered.

**Conclusions:** Posterior interhemispheric subcallosal approach is safe and allow excellent exposure for pineal region tumors in pediatric age group without incision the tentorium or the falx cerebelli.

## Global Neurosurgery

Oral presentation

Women neurosurgeons worldwide: characterizing the global female neurosurgical workforce

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**Objectives:** The goal of this study is to characterize the current female neurosurgical workforce worldwide.

**Background:** As the global neurosurgical workforce expands, so too do the contributions of women neurosurgeons. Recent studies have highlighted pioneering women leaders in neurosurgery and provided invaluable perspectives into the proportion of women neurosurgeons in various regions across the world. However, prior studies have not provided a global perspective on the female neurosurgical workforce.

**Methods:** A literature search was conducted for studies between 2016 and 2023 characterizing the neurosurgical workforce at a country level. Total neurosurgeons per country, total neurosurgeons per capita by country, and percent of women neurosurgeons by country were collected or calculated from available data. Countries were stratified by WHO region and World Bank economic classification.

**Results:** Neurosurgical workforce data was obtained for 211 nations and world maps were created demonstrating the neurosurgical workforce per capita and proportion of women neurosurgeons. China, Japan, Republic of Korea, Greece, and Germany had the highest number of neurosurgeons per capita, and 37 nations still do not have neurosurgeons. Curaçao, Cape Verde, The Gambia, Algeria, and Qatar had the greatest proportion of women neurosurgeons in their workforce, while 92 nations continue to await their first female neurosurgeon. Africa had the lowest number of total neurosurgeons, but the highest percentage of women neurosurgeons. High and upper-middle income countries had more total neurosurgeons per capita, but did not benefit from improved gender parity in their neurosurgical workforce.

**Conclusions:** Despite the progress in expanding the neurosurgical workforce and the proportion of women within it, disparities remain across the globe. As we address the global neurosurgeon deficit, improving recruitment and retention of women neurosurgeons worldwide through mentorship, collaboration, and structural support is essential.

## Neurovascular Surgery

Oral presentation

Video-based measurement of tissue acceleration as a novel metric for surgical performance during carotid endarterectomy

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**Objectives:** The video-based measurement of tissue acceleration is presented as a novel metric for the objective assessment of surgical performance during carotid endarterectomy (CEA). This study aimed to evaluate whether such novel metrics correlate with both surgeons' skill proficiency and adverse events during CEA.

**Background:** Gentle tissue handling to avoid excessive motion of affected fragile vessels during surgical dissection is essential for both surgeon proficiency and patient safety during CEA. However, a void remains in the quantification of these aspects during surgery.

**Methods:** In a retrospective study including 117 patients who underwent CEA, acceleration of the carotid artery was measured during exposure through a video-based analysis. Tissue acceleration values and threshold violation-error frequencies were analyzed and compared among the surgeon groups with different surgical experience (three groups: *novice*, *intermediate*, and *expert*). Multiple patient-related variables, surgeon groups, and video-based surgical performance parameters were compared between the patients with and without adverse events during CEA.

**Results:** Eleven patients (9.4%) experienced adverse events after CEA, and the rate of adverse events significantly correlated with the surgeon group. The mean maximum tissue acceleration and number of errors during surgical tasks significantly decreased from novice, to intermediate, to expert surgeons, and stepwise discriminant analysis showed that the combined use of surgical performance factors could accurately discriminate between surgeon groups. The multivariate logistic regression analysis revealed that the number of errors as well as vulnerable carotid plaques were associated with adverse events.

**Conclusions:** Tissue acceleration profiles can be a novel metric for the objective assessment of surgical performance and the prediction of adverse events during surgery. Thus, this concept can be introduced into futuristic computer-aided surgeries for both surgical education and patient safety.

## Oncology

Oral presentation

Effect of the enhanced recovery after surgery protocol in patients with brain tumors undergoing elective craniotomies: a meta-analysis

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**Objectives:** Systematic review and meta-analysis of available literature on the efficacy and safety of implementing the enhanced recovery after surgery (ERAS) protocol in patients undergoing elective craniotomies for brain tumor resection.

**Background:** ERAS is a perioperative protocol designed to facilitate patient recovery after major surgery. It has improved patient outcomes, reduced perioperative complications, and shortened hospital stays. Nevertheless, the application of the ERAS protocol in cranial surgery is still in its infancy. The quantitative analysis has not been reported focusing explicitly on the use of ERAS in elective craniotomy for patients with brain tumors.

**Methods:** This study followed the PRISMA guidelines and was registered in the PROSPERO database. A comprehensive search of MEDLINE, Cochrane, Scopus, and Embase databases was performed, and two independent reviewers extracted the data, assessed bias, and resolved disagreements through discussion. Primary outcomes included length of hospital stay (LOS) and hospitalization cost. The secondary outcomes were complications. A random-effects model was used to evaluate the effects of implementing the ERAS protocol using mean difference (MD) for primary outcomes and risk difference (RD) for secondary outcomes. Heterogeneity was assessed using  $I^2$  statistics and statistical significance was defined as  $P < 0.05$ .

**Results:** Eight studies, including three randomized controlled trials, three prospective studies, and two retrospective studies, were included in this meta-analysis. The ERAS group had significantly shorter LOS (MD -2.69, 95% confidence interval (CI) -3.65 to -1.73;  $P < 0.001$ ,  $I^2 = 87\%$ ) and lower hospitalization cost (MD -1188 US dollar 95% CI -1726 to -650;  $P < 0.001$ ,  $I^2 = 71\%$ ) than the non-ERAS group. There were no significant differences in the incidence of perioperative complications between the two groups.

**Conclusions:** Implementation of the ERAS protocol for elective craniotomies in patients with brain tumors effectively reduces LOS and hospitalization cost without increasing the perioperative complication rate.

## Functional

ePoster presentation

A bibliometric analysis of Stereotactic and Functional Neurosurgery in Latin America: trends, collaborations, and impact

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**Objectives:** Identify and analyze the top-cited articles in Stereotactic and Functional Neurosurgery (SFN) written by Latin American authors, and outline their key contributions and research trends, paving the way for future collaborations and directions in this topic in our region.

**Background:** SFN has witnessed remarkable advancements in Latin America, driven by technological progress and a growing pool of expertise. Nonetheless, despite the field's growing, a comprehensive bibliometric analysis focusing on Latin American contributions has never been performed.

**Methods:** The top-cited articles were extracted from the Scopus database on 24 October 2022 using keywords relevant to SFN. We selected the top-100 papers from that list, whose first or corresponding author was affiliated to a Latin American institution, and usual bibliometric indicators were collected and analyzed.

**Results:** The 100 top-cited articles were published between 1978 and 2019, across 47 different journals. On average, these articles had a citation count of 97.2. A total of 635 Latin American authors were identified, with 145 of them being women. Notably, the five most prolific authors were Velasco F., Velasco M., Velasco A.L. (Hospital General de Mexico), Cukiert A. (Epilepsy Clinic in São Paulo), and Jiménez F. (Hospital General de Mexico). Epilepsy accounted for 47% of the documents, while the remaining 53% encompassed research on psychiatric diseases, movement disorders, translational research, pain, electrical mapping, neuroanatomy, and spinal cord stimulation. Epilepsia and Neurosurgery emerged as the journals with the highest number of articles. Mexico and Brazil were the most relevant countries in terms of scientific production with the University of São Paulo and the Hospital General de Mexico being the most productive institutions.

**Conclusions:** This bibliometric analysis highlights the impactful research contributions from the region, identifies influential authors and institutions, and underscores the need for further collaboration and exploration.



## Neurovascular Surgery

ePoster presentation

### Microsurgical clipping of the ruptured intracranial aneurysms in the anterior circulation: a single-center experience

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**Objectives:** Our purposes are to review the outcome of microsurgical clipping in the treatment of ruptured aneurysms from anterior circulation at a low-resource hospital.

**Background:** Microsurgical clipping of the ruptured anterior circulation aneurysms in low-resource hospitals is different from the high-volume center. Studying the individuals of imaging, making the surgical planning, and learning about the technique from video or webinars support us in improving the results of the management of aneurysms subarachnoid hemorrhage in Saint Paul Hospital.

**Methods:** Patients with ruptured anterior circulation aneurysms at the Department of Neurosurgery, Saint Paul Hospital (Vietnam) who were treated by clipping were reviewed. We describe some technique that is suitable for a low-resource hospital. The primary outcome was the modified Rankin Scale (mRS) at the discharge and 6 months after clipping, and they were classified into "good outcome" (mRS = 0-2) and "poor outcome" (mRS = 3-6).

**Results:** From 2019 to 2023, we performed microsurgical clipping in 52 ruptured intracranial aneurysms in the anterior circulation. They include anterior communicating artery aneurysms, posterior communicating artery aneurysms, middle artery aneurysms, and anterior choroidal artery aneurysms account for 65%, 15%, 15%, and 5% respectively. The WFNS at admission grade I-III accounted for 73%, and the Fisher scale I-III included 65%. The most common complication is hospital-acquired pneumonia. Only 2 of 52 patients need a VP shunt due to chronic hydrocephalus after 6 months of follow-up.

**Conclusions:** In the setting of clipping the ruptured aneurysms in the anterior circulation, especially in a low-resource hospital, reviewing carefully the CTA, respecting the rule in craniotomy, dissection, and preservation of neurovascular structures, and making EVD routine can improve the outcome of patients.

## Skull Base

Oral presentation

An illustrative evolution of a single surgeon's experience in sella floor re-construction after endoscopic endonasal transsphenoidal pituitary adenoma resection

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**Objectives:** To illustrate the evolution in sella floor re-construction techniques employed by a single surgeon, in 62 subjects with giant pituitary adenomas operated by the endoscopic endonasal transsphenoidal approach, over a 16-year study period.

**Background:** A persistent cerebrospinal fluid leak after endoscopic trans-sphenoidal giant pituitary adenoma resection is reported to be the leading cause of morbidity in several large series. While the reported prevalence varies from 0-40%, the overall accepted incidence of this complication is 3-4%.

**Methods:** We performed a retrospective chart review of 62 subjects with giant pituitary macroadenomas who were operated by a single surgeon via the endoscopic endonasal transphenoidal approach over a 16-year study period. We specifically evaluated the evolution the sella floor re-construction techniques employed in relation to the incidence of a post-operative cerebrospinal fluid leak.

**Results:** Regarding n=62, in 12/62 (19%) subjects a free fat graft, septal bone, and a dural sealant was utilized; in 14/62 (22%) subjects a free fat graft, septal bone, a dural sealant, and pedicled mucosal flap was utilized; in 15/62 (24%) subjects a dural substitute and dural sealant was utilized, and in 21/62 (34%) subjects a dural substitute, dural sealant, and a pedicled mucosal flap was utilized. With regards our overall incidence of a post-operative cerebrospinal fluid leak requiring re-operation, in 58/62 (94%) subjects this did not occur, while 4/62 (6%) subjects experienced this complication. In the 4/62 (6%) subjects who experienced this complication, 3/4 (75%) of these subjects underwent sella floor re-construction by free fat graft, septal bone and a dural sealant, and 1/4 (25%) subject underwent dural substitute and dural sealant closure.

**Conclusions:** To prevent a post-operative cerebrospinal fluid leak requiring re-operation, and avoid its potentially devastating morbidity, we advocate the staging of transphenoidal endoscopic surgery for giant pituitary adenomas to facilitate tumor decent, rather than the routine employment of the extended approaches.

## Education, Ethics, Socioeconomic

ePoster presentation

### Early preventive strategies and CNS meningioma – Is this feasible? A comprehensive review of literature

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**Objectives:** This comprehensive review aimed to explore the existing evidence for the potential risk factors that may contribute to meningioma development and to discuss early prevention strategies.

**Background:** Meningiomas are one of the most common benign primary brain tumours; however, there is a paucity of literature on potential preventability.

**Methods:** Literature search was conducted via MEDLINE, Embase, Web of Science and Cochrane Database of Systematic Reviews to retrieve existing literature on various environmental exposures and lifestyle behaviours that are potential risk factors for the development of meningiomas in adulthood.

**Results:** Significant risk factors included exposure to ionising radiation and certain environmental chemicals. Notably, this study also identified that cigarette smoking and obesity are associated with the development of meningiomas. To date, wireless phone usage, dietary factors and traumatic brain injury remain inconclusive. Early prevention strategies should primarily be family-driven, community-based, and public health-endorsed strategies. Targeting unhealthy behaviours through healthcare organisations could execute a pivotal role in the maintenance of an optimum lifestyle, reducing the development of risk factors pertinent to meningioma oncogenesis.

**Conclusions:** To our knowledge, this is the first study that offers a perspective on prevention of meningiomas. A causal relationship of risk factors in developing meningiomas cannot be directly established with the current evidence. We are aware of the limitations of the hypothesis, but we believe that this study will raise more awareness, with findings that can be endorsed by global health organisations. Further prospective and retrospective studies are required to establish a definitive relationship.

## Spine

ePoster presentation

### Comparison of the pedicle screws placement between O-arm navigation and 3D-printed navigational templates in animal model experiment

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**Objectives:** To perform a comparative analysis of the pedicle screws placement with the application of 3D-printed templates and O-arm navigation.

**Background:** Despite a wide range of publications, a direct comparison of o-arm navigation and navigation templates printed on a 3D -was not carried out within the framework of one study.

**Methods:** The experiment was performed on five fresh anatomical specimens of the lamb's thoracic and lumbar spine. In the 1st group 44 screws (O-arm navigational system). In the 2nd group – 72 screws (3D-printed navigational templates). The main comparing criteria was the safety of implantation assessed by the cortical bone violation on postoperative CT. Additionally, the following were evaluated: implantation time, total irradiation. The accuracy of implantation was also evaluated in the 2nd group.

**Results:** The difference between the groups is significant ( $p < 0.0001$ ). In the second group, all screws were located in the bone, in the O-shaped arm group, the 0th degree was registered for 28 (64%) screws. the screws in the O-arm group are installed 2 times longer ( $p < 0.001$ ). The average deviation of the entry point was 0.50 mm, the end point was 1.10 mm. The average development time of one template was 8.75 minutes, 3D-printing - 60 minutes. The approximate cost of the navigation template is less than 50 cents. The radiation load in the first group was significantly higher than in the first group.

**Conclusions:** Pedicle screws placement with navigational templates is associated with better results of the safety and the speed of implantation compared to O-arm navigation in animal-model experiment. Based on these results we can estimate 3D-printed templates as particularly useful devices in cases of the high mobility of the spine that significantly decreases the accuracy of CT-navigation. In the clinical practice it's typical for pedicle screws placement in cervical spine and C1-2 screws placement.

## Spine

Oral presentation

Evaluation of the optimal design of navigational templates for pedicle screw placement in cervical and thoracic spine. Cadaveric study results

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**Objectives:** To perform a comparative analysis of safety and accuracy of pedicle screws placement in the cervical and thoracic spine with using individualized 3D-printed navigational templates of different design.

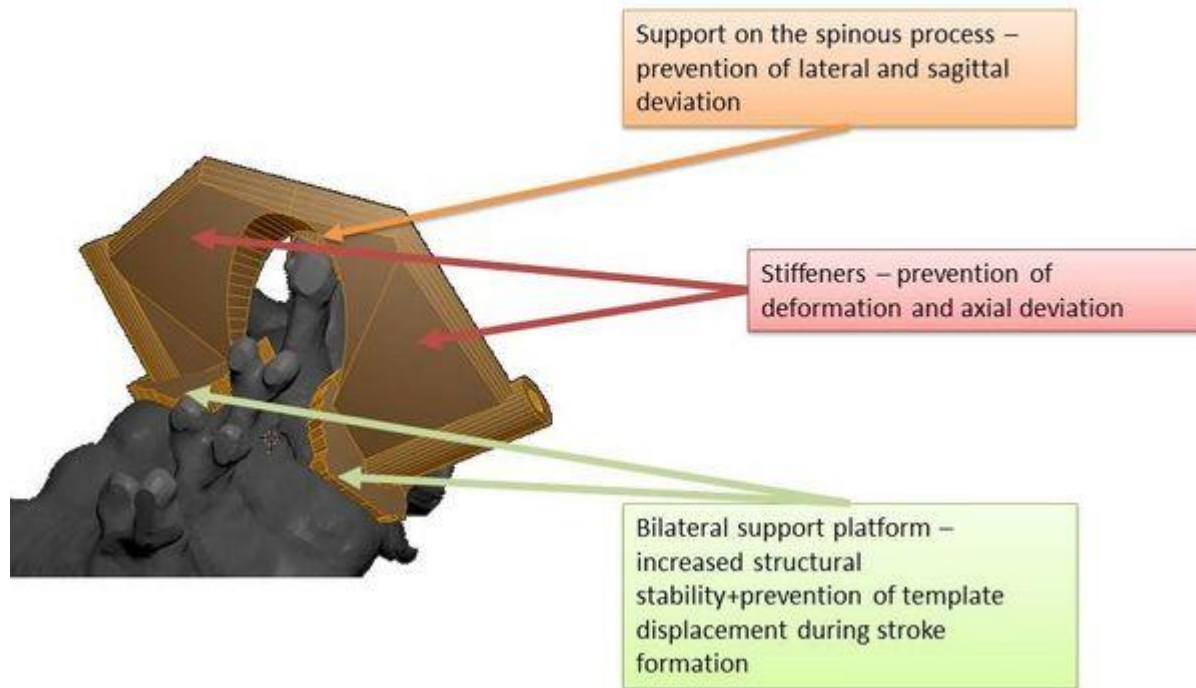
**Background:** 3D-printed navigational templates are perspective methods of spinal navigation demonstrating the highest accuracy of implantation. Despite a wide range of publications, little information has been provided on the optimal design of navigation template.

**Methods:** The study was performed on 3 cadavers. 60 pedicle screws were placed with navigational templates of different design. Three types of the templates were used, group A – monolateral templates, group B – bilateral templates, group C – bilateral 3-point templates bearing on spinous process. The safety and the accuracy of the screws implantation were evaluated and compared based on postoperative CT data.

**Results:** 3-point templates have demonstrated the highest safety rate, only one screw (5%) perforated pedicle's wall with grade 1, 19 screws (95%) were completely surrounded by bone structures. In group A 3 screws (15%) were placed with grade 1, 1 screw (5%) – with grade 2. In group B 2 screws (10%) were placed with grade 1, 1 screw (5%) – with grade 2. The mean deviation in entry point in group A was  $5,0 \pm 0,5$  mm, in group B -  $1,7 \pm 0,3$  mm, in group C -  $0,35 \pm 0,05$  mm. The differences between groups are statistically significant ( $p < 0,05$ ).

Conclusions:

## Optimal design



for pedicle screws placement in cervical and thoracic spine it's recommended to use bilateral 3-point navigational templates bearing on spinous process with an additional stiffener between the guide tubes.

## Oncology

ePoster presentation

### Endoscopic biopsy of primary CNS lymphoma in South Africa, a case study

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**Objectives:** To report on a case of successful histological confirmation of primary CNS lymphoma via endoscopic biopsy during endoscopic third ventriculostomy.

**Background:** Primary CNS lymphoma, a rare form of malignant brain tumour, accounts for approximately 0.3-1.5% of primary CNS tumours internationally. Immunocompromised individuals such as those with advanced HIV have a higher risk of developing CNS lymphoma, it is therefore an important disease entity in South Africa due to the HIV epidemic. Endoscopy is now a widely used technique to biopsy ventricular/ paraventricular tumours with its use increasing in recent years. Prior to endoscopy stereotactic or open biopsy was the method of choice to diagnose primary CNS lymphoma. Endoscopy provides a safe and versatile alternative for obtaining a histological diagnosis while concurrently allowing for CSF diversion via endoscopic third ventriculostomy or assisting with ventricular peritoneal shunting if required.

**Methods:** A retrospective review of the patient's records was performed and case study written up.

**Results:** An 83yo male, who previously had burr hole drainage of a traumatic chronic subdural haematoma 2 years prior, presented with headaches and confusion. Imaging demonstrated a homogeneously enhancing mass lesion at the level of the interventricular foramen causing midline shift and entrapment hydrocephalus on the third ventricle. A right frontal burr hole was made, ventricular access was achieved, endoscopic third ventriculostomy was performed, thereafter the tumour was identified and biopsied using ridged endoscopy. Microscopy revealed neural tissue infiltrated with monomorphic cells with features typical of a lymphoproliferative disorder. Immunohistochemical examination was performed and the diagnosis of diffuse large B-cell lymphoma was confirmed. The patient did well post operatively, with improvement of hydrocephalus on subsequent imaging and was referred for further oncological and radiation therapy.

**Conclusions:** Endoscopic biopsy is a safe, effective and minimally invasive way to biopsy primary central nervous system lymphoma while concurrently allowing for CSF diversion procedures.

## Endovascular Neurosurgery

Oral presentation

MMA embolization for chronic subdural hematoma, is it a real option?

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**Objectives:** To evaluate the resolution rate of subdural hematomas treated by MMA embolization in two scenarios, without surgery, and after surgical evacuation.

**Background:** There are some reports that point to MMA embolization as a first-line treatment option or as an option for the treatment of recurrences. Traditional treatment consists of burr holes or craniotomies for surgical evacuation, with recurrence rates ranging from 2% to 37% or even higher.

**Methods:** This is a single-center, independent, and retrospective study of prospectively collected data destined to record consecutive patients treated with endovascular embolization of the MMA for Chronic Subdural Hematoma. MMA embolization was performed using selective microcatheterization and liquid embolization agents. Outcomes were assessed with interval CT scan at 4wk up to 52 wk postprocedure.

**Results:** A total of 59 patients were reviewed, with an average follow-up of 35 weeks (12-52). The average age was 70 years (59-81). The average chronic subdural hematoma remnant at 52 weeks was 27.7%. The need for surgical evacuation after embolization was 1 patient (1.69%). 98.3% of post-embolized patients did not require additional management.

**Conclusions:** MMA embolization could be an alternative to surgical evacuation for untreated cSDH and for recurrent cSDH after surgical evacuation, or as prophylaxis after surgery to reduce the risk of recurrence.



## Oncology

ePoster presentation

### Neuro-oncology in Indonesia: current status, challenges, and future perspectives

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**Objectives:** To present the current status, challenges, and future perspectives of neuro-oncology in Public Hospitals in Indonesia.

**Background:** As a developing country with minimal resources, Indonesia has a lot of obstacles in providing the standard of care for neurooncology patients. A unique geographical situation with more than 17.000 islands also contributes to this problem. Current status of national neurooncology service needs to be describe to see the challenges and opportunity furthermore helping to decide the future improvement needed for government national neurooncology program.

**Methods:** A descriptive analysis of a cross-sectional study was made in May 2023. The data was collected by the Stroke and Cancer Program in collaboration with the Ministry of Health. Three major categories were made: human resources, instruments, and therapies provided by each hospital in the cancer program. Each category was shown in tables and graphs, while the level of the hospital was made by calculating the average score of the provinces and divided into levels, from levels 1 to 4.

**Results:** A total of 445 public hospitals from 34 provinces in Indonesia responded. From our analysis, it shows that the distribution of human resources, instruments, and therapies is still uneven. These three categories are heavily concentrated in Java Island, especially Jakarta, Central Java, and East Java. According to the level of hospitals analysis based on the provinces' average score, most of the public hospitals are on levels 1 and 4 (both are 9 provinces; 26.5%), ranging from 3.22-4.60 and 6.95-9.32, accordingly. The province with the highest average score is Jakarta (9.32) followed by East Java (8.70), while the lowest is West Papua (3.22).

**Conclusions:** There is an urgent need to improve and develop existing and non-existing neuro-oncology personnel, logistics, and treatments for better neurooncology service in Indonesia.

## Spine

ePoster presentation

### Role of lateral mass fixation of sub axial spine in compressive myelopathy

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**Objectives:** To demonstrate the role and versatility of lateral mass screw fixation in management of degenerative cervical spine disease and favorable outcome in patients.

**Background:** Cervical degenerative disease in one of the common conditions, especially in the elderly and are an important cause of disability in this population. Degenerative changes usually affect multiple levels simultaneously and anterior approach becomes extensive and at times morbid. Posterior decompression by laminectomy and widening of canal is simpler and a versatile approach and adequate spinal stabilization can well be achieved with Lateral Mass Fixation present our experience in 70 patients.

**Methods:** 70 patients diagnosed with degenerative cervical spinal disease and compressive myelopathy were diagnosed and operated in our center from 2018 to 2022. Inclusion and exclusion criteria were defined. All patients underwent laminectomy and lateral mass fixation with correction of lordosis. Outcome was assessed with periodic imaging and clinical improvement. maximum follow up is of 24 months.

**Results:** 94% patients showed clinical improvement and 72 % showed reversal of myelopathic changes to variable extent. 6% patient did not show clinical improvement. None of the patients deteriorated after surgery and on follow up. screw placement was appropriate in all the patients. there was no displacement or injury due to screw placement

**Conclusions:** Posterior Cervical decompression and lateral mass screw fixation is a simple, versatile and effective method in cervical compressive myelopathy. There are various techniques of screw placement and can be undertaken in different patient conditions. It is easy to learn and perform.

## Trauma

ePoster presentation

Outcome of surgically treated acute epidural hematoma. A 32 month prospective observational study

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**Objectives:** Assess socio-demographic characteristics, the surgical outcome and determine factors affecting the outcome.

**Background:** Acute Epidural hematoma is a neurosurgical emergency which warrants prompt surgical removal. The early mortality rate was 86%, which has reduced now by introduction of imaging modalities, proper resuscitative measures and timely surgical intervention to 5 to 12%.

**Methods:** A 32 month prospective observational study conducted at Tikur Anbessa specialized hospital and ALERT trauma center, Addis Ababa, Ethiopia. A total of 132 patients were included. Data was collected from interviewing patients or relatives, patient's chart and CT scan results using a structured questionnaire, then coded and analyzed using SPSS, version 25.

**Results:** In this study 132 patients were included. Males are affected more (92.4%). The mean age at presentation was 30.8 yrs (13 - 67). Commonest mechanism of injury is assault (59.1%) followed by RTA (25.8%). GCS at presentation lies in the range of 14-15 (mild) in 48.5% and Majority had normal pupils at examination (89.75%). 98.5% of hematomas are Supratentorial with a tendency to be unilateral in 91.6 %, left side being affected more than the right (49.2 Vs 42.4%). Parietal region was the most common location (61.4%). The mortality rate is 3% & 6.8% of the cases were discharged in vegetative state. Good recovery (GODS 7 & 8) was obtained in 75% of patients. The factors associated with poor outcome were effacement of basal cisterns (P=0.043), low post-resuscitation GCS (P=0.004), presence of hemiparesis (p<0.001), low O2 saturation (P=0.007) and abnormality in pupillary size and light reaction (P=0.014).

**Conclusions:** The mortality rate of AEDH was 3% which is comparable with the global figures (3-6%). 75% of patients were discharged in good functional recovery. Factors that were significantly associated with poor outcome are presence of low GCS at presentation, effacement of basal cisterns, hemiparesis/plegia, low O2 saturation and pupillary abnormality.

## Global Neurosurgery

Oral presentation

Neurosurgery cocktail-role in research, communication and connecting neurosurgeons worldwide

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**Objectives:** To analyze social media usage and opinions among neurosurgeons in terms of research, communication and connection within neurosurgeons.

**Background:** Social media has become an important communication tool in modern life and its use is undoubtedly increasing worldwide. Given the rising importance of social media in the healthcare system, little is known about neurosurgeons' social media use and interactions in the context of professional purposes.

**Methods:** An online survey was administered to neurosurgeons worldwide. A total of 1119 neurosurgeons from 104 different countries responded to the questionnaire.

**Results:** All participants were members of at least one social media platform. Older neurosurgeons and non-academics spent less time on social media ( $p < 0.05$ ). Communication with peers via social media decreased with age, while communication via e-mail increased ( $p < 0.05$ ). Majority of respondents perceived the effect of social media to be beneficial on contribution to neurosurgery (very beneficial [28.73%], somewhat beneficial [35.55%]). Compared to males, females considered that social media platforms provided a greater chance for networking opportunities, learning about a new study or conference, and providing rapid and widespread knowledge transfer ( $p < 0.05$ ). Misguided information (44.68%) and violation of privacy (41.64%) were thought as the main disadvantages.

**Conclusions:** social media use, opinions and attitudes among neurosurgeons varies depending on their age, gender or practice settings. Most neurosurgeons stated that the use of social media could have beneficial and advantageous effects on neurosurgery practice, while the frequency of misleading information and lack of privacy were perceived as barriers. It has good impact on research.

## Education, Ethics, Socioeconomic

ePoster presentation

Bibliometric analysis of 6 major European neurosurgical publications from 2011-2020 (Part 3): a comparative metrics review

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**Objectives:** To perform a bibliometric analysis of 6 European neurosurgical journals to build on our previous studies.

**Background:** We previously conducted bibliometric analysis of 6 North American neuro- surgical journals.

**Methods:** We searched Web of Science for articles published in *Acta Neurochirurgica*, *British Journal of Neurosurgery*, *Child's Nervous System*, *Journal of Neurological Surgery Part A: Central European Neurosurgery*, *Journal of Neurosurgical Sciences*, and *Neurosurgical Review* between 2011 and 2020. We analyzed bibliometric parameters related to total annual document distribution, author metrics, journal metrics, country and continental distribution, institution, keywords, and journal impact.

**Results:** European countries provided the greatest contributions. *Acta Neurochirurgica* followed by *Child's Nervous System* published the greatest number of articles and had the highest h-index and number of citations. From 2018 to 2020, total documents increased 79.6%, original articles increased 86.5%, review articles increased 103.6%, citations increased 79.6%, number of publishing authors increased 72.1%, number of authors in multi-author documents increased 72.4%, and author's keywords and keywords plus increased 72.4% and 27.0%, respectively. The collaboration index decreased 5.3% from 4.49 to 4.25. Annual published documents and citations were lower for European journals versus North American journals.

**Conclusions:** Several parameters of the European journals increased by 2020. One interesting finding is that growth for the 6 journals dramatically increased in the 2 years prior to the COVID-19 pandemic. While neurosurgeon free time during lockdowns may account for much of the increase in 2020, the trend began before this. Our analysis did not identify a cause for the pre-COVID increases.

## Trauma

Oral presentation

Prognostication of traumatic brain injury using international mission for prognosis and analysis of clinical trials score in Nepalese cohort

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**Objectives:** 1. To prognosticate patients with traumatic brain injury in Nepalese population using IMPACT model. 2. To correlate the impact core, extended and lab scores with GOS in moderate and severe TBI patients at one and six months.

**Background:** Prognostic models are useful for making decisions in traumatic brain injury. The aim of this study was to assess the accuracy of IMPACT score in predicting outcome in moderate to severe TBI at 3 months.

**Methods:** All patients admitted to National Trauma Center, National Academy of Medical Sciences with moderate to severe traumatic brain injury from February 2020 to February 2021 were included in the study. IMPACT scores (core/extended core/lab) were recorded separately at admission. Outcome was measured with GOS at the time of discharge and at six months. Correlation between observed and predicted outcomes was evaluated by Pearson's correlation coefficient ( $r$ ). Sensitivity and specificity were plotted in the ROC curve, AUC calculated to determine the discrimination ability of this prognostic model.

**Results:** Hundred and twelve patients were enrolled in the study. Eighty (71.4 %) patients had moderate and 32 (28.57 %) had severe TBI. The median age was 33 years with male preponderance (M: F=4:1). Thirty three (29.5 %) patients died within 6 months of TBI, and 38 (33.9 %) patients had an unfavorable outcome. Pearson correlation coefficient showed good correlation between observed and predicted outcomes. Hosmer-Lemeshow test showed good model fit for IMPACT core, IMPACT extended and IMPACT lab in diagnosing mortality and unfavorable outcome in six months ( $p > 0.05$ ). The ROC curve indicated that all 3 models could accurately discriminate between favorable and unfavorable outcomes, as well as between survival and mortality.

**Conclusions:** The IMPACT score is a good prognostic model to predict 6-month outcomes in moderate to severe TBI at admission in Nepalese patient with IMPACT lab having the greatest discriminating ability.

## Global Neurosurgery

ePoster presentation

### Concomitant bilateral posterior fossa and cervical spine subdural hematoma following anticoagulant therapy: a case report and literature review

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**Objectives:** To report a rare case and carry out a literature review.

**Background:** Spontaneous intracranial hemorrhage is one of the fatal complications of oral anticoagulant therapy, with an incidence of 0.3 to 0.7% per year. The concomitant spontaneous posterior fossa and spinal subdural hematoma is an even rarer entity. To the best of our knowledge, there are no recorded cases in modern literature on concomitant bilateral posterior fossa and cervical spine acute subdural hematoma following warfarin anticoagulation therapy. The choice of management in patients with posterior fossa SDH with signs of intracranial hypertension is evacuative surgery. Conservative management of spinal SDH is pursued when there are only mild neurologic deficits or if the patient is in poor general medical condition to undergo major surgery.

**Methods:** We are presenting a case report with a detailed case presentation and extensive literature review.

**Results:** We identified only ten published case reports describing concomitant posterior fossa and spinal SDHs. Nine out of the ten previously reported cases involved male patients, with four of them occurring in the pediatric age group. In three of the cases, there was a history of trauma. One patient was on aspirin, and three of the pediatric cases had aplastic anemia. SDH of the spine was treated with laminectomy and hematoma evacuation in two patients and with a lumbar puncture in one patient. In all cases, the posterior fossa SDH was managed conservatively.

**Conclusions:** Concomitant posterior fossa and cervical spine SDH in a warfarin anticoagulated patient is an extremely rare complication, and our case is the first of such reports in the literature. Conservative management is an option for majority of patients who present with a poor medical condition or are mildly symptomatic. But with significant neurologic compromise from raised ICP or neural compression, surgical intervention will be required.

## Oncology

Oral presentation

### Epilepsy in surgically treated low-grade gliomas: a single-centre experience

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**Objectives:** Aim to compare differences between patients taking pre-existing Anti-Seizure Medications (ASM) versus no ASM and patients undergoing awake vs asleep surgery.

**Background:** Epileptic seizures are the most common symptom for patients diagnosed with low-grade glioma (LGG). Glioma-related epilepsy (GRE) and subsequent seizure type vary with tumour characteristics, such as: lobar location, cortical vs subcortical, histological type and size of tumour. Pre-operative management of patients with and without seizures using anti-seizure medication (ASM) varies amongst clinicians. We aim to report our centre's experience of managing GRE.

**Methods:** Data was retrospectively collected from our Neuro-oncology Database between May 2006 to May 2022 . We evaluated the prevalence of seizures at three timepoints: <15-days, 15 days to < 3 -months and 3-months to 12-months. Three separate multi-variate analysis were performed using pre-specified confounders. Statistical significance was considered a two-tailed p-value <0.05.

**Results:** 257 cases were included in this study, with 189 cases on pre-existing ASMs, 13 commenced on prophylactic ASMs and 55 cases with no ASMs. Frontal (56%) and temporal (30.4%) were the most common locations of LGGs. Awake craniotomy was performed in 105 cases (40.9%). Overall, 114 cases experienced at least one seizure episode within 12-months of surgery. The extent of resection (EOR) was inversely proportional to seizure freedom at all timepoints with an overall statistical significance shown when near-total, sub-total and biopsy were compared with gross-total resection. The use of ASMs showed an increased odds of seizure by 12-months post-surgery, although the effect is not statistically significant (OR 2.13, 95%CI 1.00 to 4.52, p = 0.05).

**Conclusions:** Pre-operative ASMs do not reduce the risk of seizures post-operatively, although this is dependent on multiple factors: awake versus GA surgery, EOR, histology type and tumour location. Overall, a prospective and larger sample size study are needed to determine the true benefits of ASMs in LGG patients.



## Trauma

ePoster presentation

### Early neurorehabilitation after severe TBI in acute care

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**Objectives:** The aim of the study is to assess the implementation of early rehabilitation programs for patients after traumatic brain injury in acute and ICU care and to evaluate the outcome after 12 and 24 months.

**Background:** Rehabilitation medicine is now challenged by patients who survive TBI with severe complex deficits. Early neurorehabilitation programs can be implemented not only in rehabilitation hospitals, but also in the neurosurgical ICU and acute care. Especially early mobilisation including bed cycling, therapeutic verticalization, dysphagia therapy, multisensory stimulation and other specialized therapy options are one of the main points in the therapy program.

**Methods:** A total of 51 survivors (age 34, range 16-64 years, m:f = 4 :1) of severe brain injury (GCS  $\leq$  8 for at least 24 hours) underwent an interdisciplinary early rehabilitation program. Duration of rehabilitation program was at mean 18 (4-78) days adapted to the individual capability for 3-4 hours/ day, until they were discharged from hospital. The follow-up examination took place 12 and 24 months after the TBI.

**Results:** High level of independence in activities of daily living (ADL), mean Barthel Index after one year 92.7 points, after two years 93.7 points. After one and two years, 74.5% and 80.4% of the patients, respectively, were completely independent of need for care. Return to work rates improved between one and two years after trauma, as evidenced by the rate of patients being back to full time work at one year (n=14, 28%) and two years (n=20, 40%) post-STBI, although none of these changes reached statistical significance.

**Conclusions:** The successful implementation of early neurorehabilitation programs for TBI patients in ICU and acute care is possible. Focussed on outcome, the data revealed a high level of independence in ADL, but a low level of the possibility of professional reintegration.

## Trauma

ePoster presentation

Chronic subdural hematoma associated with an arachnoid cyst in elderly, an intraoperative finding after re-bleeding: case report

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**Objectives:** Intracranial arachnoid cysts (AC) are believed to be congenital and chronic subdural hematomas tend to occur in elderly patients with a history of mild head injury. We show the possibility of this rare association, between a chronic subdural hematoma (CSDH) and an arachnoid cyst (AC), in the elderly and highlight the difficulties associated with treatment.

**Background:** We present this case because of its rarity and see if there is consensus in its treatment.

**Methods:** We present a case report.

**Results:** We report a 65-year-old man who presented with headache and dizziness of 2 months' duration with an history of head injury. Brain computed tomography (CT) a CSDH in right side and an hygroma in left side. After first operation with burr holes in both sides, the patient underwent an early recurrence of acute subdural hematoma in the right side. The evacuation of this hematoma by a craniotomy allowed to see an AC that we resected partially with complete recovery of the patient.

**Conclusions:** The association CSDH/AC is rare and possible in elderly patients and there is no consensus on treatment.

## Trauma

ePoster presentation

### Non-missile orbito-cranial penetrating injuries - own experience and treatment strategy

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**Objectives:** Authors present cumulative own experience in managing 3 such injuries treated both surgically and conservative in 2022 – 2023.

**Background:** Non-missile penetrating orbito-cranial injuries are rare. They are both a rare type of cranio-cerebral injuries and are uncommonly dealt with in a civilian context.

**Methods:** 1. Male aged 45 a glass penetrating injury through the roof of the orbit to the frontal lobes. The patient is in fairly good general condition. Surgical treatment was performed to remove the glass piece from the frontal lobe. The outcome was good.

2. Female aged 48 three months after a glass injury in the orbital area. She complained of periodic headaches. Computed tomography showed a fragment of glass in the anterior cranial fossa. Due to the very good condition and healed wound, the decision was made to proceed with conservative treatment and observation.

3. Female aged 55 in an extremely severe condition, after trauma penetrating a metal rod through the orbita into the cranial cavity, with extensive intracerebral hemorrhage (Figure), in a coma. Surgical treatment was performed: brain decompression, evacuation of hematomas and clipping of damaged vessels in the area of the anterior cerebral arteries. Despite surgical treatment, the patient was diagnosed with brain death 4 days after the injury.

**Results:** In two cases surgical treatment was performed (66.67%), in one conservative treatment (33.33%). In the case of a severe state, the prognosis was poor, regardless of the neurosurgical procedure undertaken.

**Conclusions:** Non-missile penetrating orbito-cranial injuries are rare, but they are a heterogeneous group of injuries. Depending on the severity of the injury and the delay to diagnosis, treatment may be surgical and sometimes conservative. This is consistent with the literature data indicating that its surgical management is controversial, due to the lack of widely accepted guidelines. The prognosis is also varied depending on severity of brain damage.

## Global Neurosurgery

Oral presentation

Neurosurgery in Australia's Top End: the lifesaving and economic advantages of developing sustainable neurosurgical care in rural and remote regions

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**Objectives:** To perform a retrospective audit of all emergency cranial neurosurgery performed at Royal Darwin Hospital (RDH) in the first five years of the unit and to compare our data to "Emergency Neurosurgery in Darwin: Still the Generalist Surgeons' Responsibility," published in 2015.

**Background:** The Northern Territory of Australia is vast and remote. Its inhabitants are highly vulnerable and have had to seek lifesaving care in other urban centres within Australia. In 2017, a dedicated neurosurgical unit was established at the RDH. Prior to this, emergency neurosurgery was undertaken by the general surgeons under the guidance of neurosurgeons in Adelaide providing advice remotely.

**Methods:** All emergency cranial neurosurgery performed by a neurosurgeon was identified between 2017 and 2021. Spinal neurosurgery, surgery performed by general surgeons and minor procedures were excluded. Data was extracted from the National Critical Care and Trauma Response Centre database.

**Results:** 320 patients underwent 427 emergency neurosurgeries at RDH. 96 presented as traumas and 42% of patients were indigenous. There were 35 emergency neurosurgeries in Darwin in 2017 and 82 in 2021. The most common procedure performed was "insertion of an EVD" followed by "craniotomy and removal of intracranial haematoma." Mortality was 7.5% overall and 8.4% amongst traumas. Only age proved to be a statistically significant independent risk factor for death ( $t = -2.95$ ,  $p < 0.0041$ , odds ratio 1.06  $p = 0.02$ ). Location, sex, injury severity and presenting GCS were not associated with death. Indigenous patients did not fare more poorly than non-indigenous patients.

**Conclusions:** Our data suggests the importance of developing small but sustainable neurosurgical units in rural and remote areas. A dedicated neurosurgical unit at RDH has led to a drastic increase in the amount and variety of emergency neurosurgery performed in Darwin. Interstate transfers have reduced significantly. This has tangible lifesaving and economic advantages.

## Oncology

ePoster presentation

Uncommon presentation of giant cell tumor of the skull in a pediatric patient: a case report

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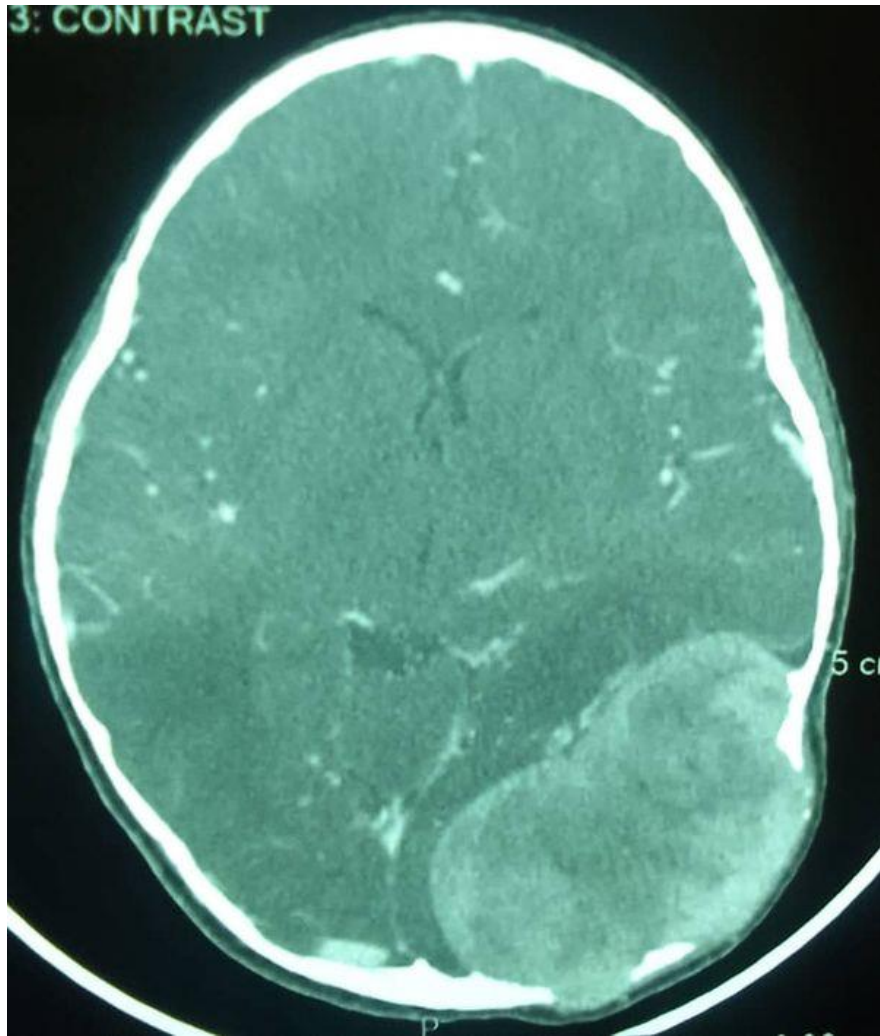
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**Objectives:** To describe a unique presentation of giant cell tumour of the skull in a paediatric age.

**Background:** Giant cell tumors of the bone are remarkably rare in children. It exhibits local aggressiveness, and has been reclassified from a benign to intermediate group by the World Health Organization. In particular, their occurrence within the skull is extremely uncommon, accounting for less than 1% of reported cases.

This case report describes a unique presentation of giant cell tumour in a 5-year-old female patient.

**Methods:** This case report describes a unique presentation of giant cell tumour in a 5-year-old female patient who presented with progressive bony swelling on the left side of the scalp and monoparesis in the right lower limb persisting for 8 months. A cranial computerized tomographic scan revealed a distinct 80 x 72 x 42mm osteolytic bony mass with intracranial extension in the left parieto-occipital region, displaying avid enhancement. Comprehensive metastatic workup yielded negative results. She was treated by gross total resection of the tumour using left parieto-occipital craniectomy and primary cranioplasty with titanium mesh.



**Results:** Histology revealed features suggestive of giant cell tumour of the bone. Immunostaining with CD68 and vimentin is observed while there is no expression of p63.

The proliferative rate with Ki67 is less than 2%. At follow up 2-month post resection she has full power in the right lower limb.

**Conclusions:** This case report contributes valuable insights to the existing literature on giant cell tumours of the skull in paediatric patients, highlighting their unusual manifestation and successful management.

## Spine

ePoster presentation

### Accuracy and safety of fluoroscopy-assisted transpedicular screw insertion in thoracolumbar spine surgery: evaluation of 122 screws

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**Objectives:** The objective of this study is to determine the accuracy and safety of trans-pedicular screws' insertion in the thoracolumbar spine using a fluoroscopy-assisted surgical technique.

**Background:** We retrospectively evaluated all patients who underwent a postoperative computed tomography scan to assess the location of the pedicular screws following thoracolumbar spinal surgery, at the Mohammed Vth Military Training Hospital-Rabat, from January 2020 to April 2022.

**Methods:** We used Gertzbein's classification to grade pedicular cortex breaches. A screw penetration greater than 4mm (grades D–E) was considered critical and one less than 4mm was classified as noncritical (grades A–C). A total of 122 screws inserted in the T1 to L5 vertebrae were included from 25 patients.

**Results:** The average age was 46 years old. Pathologies included degenerative disorders (5 patients), tumors (8 patients), and trauma (12 patients). All screws were inserted using lateral and anteroposterior fluoroscopic guidance. A total of 11 transpedicular screws breaches were identified. The breaches incidence was significantly higher in thoracic pedicles (8 screws) than in lumbar pedicles (3 screws). Of these, three critical cases occurred in two patients and one of them required reintervention. The remaining eight exceedances were not critical and were closely monitored and followed up.

**Conclusions:** Transpedicular screws fluoroscopy-assisted surgical fixation can be performed for the stabilization of the thoracolumbar spine with satisfactory safety and precision.

## Spine

ePoster presentation

### Congenital spondylolytic spondylolisthesis of the cervical spine: a case report and literature review

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**Objectives:** CSS is an uncommon congenital anomaly usually affecting C6. Its correct diagnosis and distinction from traumatic articular pillar fracture or dislocation are of paramount importance in patients who have sustained cervical spine trauma, to prevent unnecessary surgical management.

**Background:** We report the case of a sixth cervical vertebra Congenital Spondylolytic Spondylolisthesis (CCS), discovered fortuitously following a minor trauma, in a 19-year-old male patient, treated conservatively with a favorable evolution.

**Methods:** Congenital spondylolytic spondylolisthesis (CSS) is characterized as a pars-interarticularis well-corticated cleft with antherolithesis. The presence of spina bifida and vertebral dysplastic changes corroborate the possibility of a congenital etiology. It is a rare condition, usually discovered incidentally, especially after a trauma and should be differentiated from traumatic spondylolysis, which requires aggressive treatments. The management is often conservative, with surgery being indicated for symptomatic or unstable lesions.

**Results:** The patient was conservatively managed with a cervical collar, and analgesics. He was pain free after 10 days, and restarted his normal activity. At 6 months follow-up the patient was asymptomatic.

**Conclusions:** CSS is an uncommon congenital anomaly usually affecting C6. Its correct diagnosis and distinction from traumatic articular pillar fracture or dislocation are of paramount importance in patients who have sustained cervical spine trauma, to prevent unnecessary surgical management. The majority of patients are treated conservatively. Surgery is indicated in cases of conservative management ineffectiveness, mechanical instability or the presence of a neurologic deficit.



## Global Neurosurgery

Oral presentation

The gravity-assisted posterior interhemispheric transfalcine transprecuneus approach (PITTA): visual field results and postoperative T2W1/FLAIR changes analysis

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**Objectives:** We evaluated the utilization of rigid retraction, visual field range, and the extent of postoperative T2W1/FLAIR changes.

**Background:** The gravity-assisted posterior interhemispheric transfalcine transprecuneus approach (PITTA) provides a suitable trajectory for accessing the peritrial region, which belongs to difficult-to-reach brain areas due to their deep location and proximity to functionally important structures.

**Methods:** We retrospectively analyzed a series of 17 patients who underwent surgery using the PITTA approach for various lesions. The need for rigid retraction was determined based on surgical protocols. The visual field range was assessed through detailed clinical examination and/or computerized perimetry, and MR T2W1/FLAIR changes were evaluated using a 3-grade scale according to Shigemoto by an independent radiologist.

**Results:** None of the cases required the use of rigid retraction on the access side. In four cases, transient retraction was employed on the lesion side to support the parietal lobe, which tended to fall into the surgical corridor. One patient with a left trigone meningioma died due to massive pulmonary embolism. Sixteen patients were then evaluated. No patient experienced worsening of the visual field corresponding to the approach side. The visual field corresponding to the lesion side remained unchanged in 14 patients, while two patients showed improvement. On the approach side, FLAIR changes worsened by one grade in one patient without clinical symptoms, while the range of changes remained identical in the remaining 15 patients. On the lesion side, preoperative FLAIR changes were mostly due to collateral edema, with the range of FLAIR changes improving in eight patients, remaining identical in seven patients, and worsening by one grade in one patient.

**Conclusions:** Our study suggests that the PITTA approach is a safe method in terms of potential jeopardizing the visual field range, and the risk of brain tissue damage on the approach side is minimal.

## Global Neurosurgery

ePoster presentation

Intracranial iodinated contrast medium deposits 50 years following a previous myelography: a case report and literature review

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**Objectives:** This case serves as a reminder to diagnosticians of the historical use of lipiodol® as a contrast agent, with evidence of its residual effects that can still be encountered in today's practice.

**Background:** Lipiodol, an iodized oil, was widely used as a contrast agent in conventional myelography for years and provided excellent radiographic visualization of the subarachnoid spaces. Although rare, images of its residues may still be encountered in modern radiographic imaging.

**Methods:** We report a case of an 86-year-old man with a migration of lipiodol in the intracranial subarachnoid spaces. The patient had undergone a myelography in the early 1970s, 50 years earlier.

Many physicians, especially young neurosurgeons, and radiologists, do not have enough information and experience with this type of contrast media. The presence of iodinated oilbased contrast media residues in the subarachnoid spaces after a previous myelography has been most commonly reported in the lumbar and thoracic spines. However, CT images of intracranial locations have been exceptionally documented, reason why we describe the following case.

**Results:** The patient was managed conservatively and did not undergo any surgical interventions. He received symptomatic treatment with paracetamol and acetyllecine. The patient was symptoms free after ten days, and was diligently followed up at the outpatient department. He was satisfied with our care and management.

**Conclusions:** Neurosurgeons and radiologists should be aware of this imaging appearance, and be able to differentiate it from possible pathologies.

## Spine

ePoster presentation

### Ligamentum Flavum Hematoma in the lumbar spine mimicking spinal tumor: a case report and review of the literature

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**Objectives:** The objective of this case report is to emphasize the significance of diagnosing Ligamentum flavum hematoma. We present a surgically confirmed lumbar LFH case that mimicked a lumbar tumor, highlighting the challenges encountered during diagnosis and subsequent management.

**Background:** The ligamentum flavum can undergo various pathological changes, such as hypertrophy, calcification, ossification, and cyst formation, which may lead to compression of the spinal cord. One rare but significant cause of spinal nerve compression is LFH. Although approximately 30 cases of lumbar LFH have been previously documented in the literature, the exact underlying pathogenesis of this condition remains unclear. Moreover, diagnosing LFH using magnetic resonance imaging (MRI) poses challenges due to the dynamic nature of hematoma intensity on imaging.

**Methods:** We discuss the clinical features, radiological findings, surgical management, and histopathological examination results of the patient. Additionally, we review the existing literature on lumbar LFH to enhance our understanding of this rare condition and highlight the diagnostic and therapeutic considerations associated with it. The aim of this case report is to contribute valuable insights into the diagnosis and management of lumbar LFH, further expanding our knowledge on this intriguing clinical entity.

**Results:** It is crucial for clinicians to maintain a high index of suspicion for LFH, especially in cases where other diagnoses are inconclusive or where there is a discrepancy between clinical presentation and imaging findings. Appropriate surgical intervention can lead to successful outcomes, as demonstrated in our case and the previously reported cases.

**Conclusions:** LFH is a rare cause of spinal nerve compression, and its preoperative diagnosis remains challenging due to its rarity and overlapping clinical presentations with other conditions. Surgical removal of the hematoma provides excellent results, with rapid recovery and resolution of symptoms. Increased awareness of LFH among clinicians can lead to timely diagnosis and appropriate management, improving patient outcomes.

## Global Neurosurgery

ePoster presentation

### A rare association between intracranial neuroenteric cyst and Klippel-Feil syndrome: a case report

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**Objectives:** To report a rare case of concurrent intracranial neuroenteric cyst (NEC) and Klippel-Feil syndrome (KFS) and describe the clinical presentation, management, and histopathological findings.

**Background:** Neuroenteric cysts (NECs) are rare congenital anomalies derived from endodermal tissue, accounting for only 0.01% of all tumors. Most NECs are typically found in the spinal region. Klippel-Feil syndrome (KFS) is a congenital disorder characterized by the fusion of two or more cervical vertebrae. The coexistence of NEC and KFS is an extremely rare occurrence, with few cases reported in the literature.

**Methods:** .

**Results:** *Case report:* A 21-year-old male patient, previously diagnosed with Klippel-Feil syndrome, presented to the hospital with clinical symptoms associated with the syndrome. The patient's symptoms progressed, leading to the development of obstructive hydrocephalus secondary to an infratentorial lesion located in the right cerebellum. To relieve the hydrocephalus, an urgent ventriculoperitoneal shunt was placed and a midline suboccipital craniectomy was performed, including the resection of the posterior arch of C1, and complete excision of the intracranial lesion was achieved.

Histopathological analysis confirmed the presence of a neuroenteric cyst. No complications were reported postoperatively, and the patient showed improvement in neurological symptoms during follow-up.

**Conclusions:** This case highlights the rare coexistence of an intracranial neuroenteric cyst and Klippel-Feil syndrome. It emphasizes the importance of considering neuroenteric cysts in the differential diagnosis of intracranial lesions, particularly in patients with associated congenital abnormalities like Klippel-Feil syndrome. Further studies are necessary to enhance our understanding of the clinical characteristics and management strategies for this unique condition.

## Spine

ePoster presentation

### Could psilocybin be a safe and effective alternative for the treatment of severe refractory pain? Experience in lumbar spinal stenosis treatment

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**Objectives:** To present the experience of an elderly patient with Lumbar Spinal Stenosis (LSS) using psilocybin microdosing and its effects in pain control, disability, quality of life and mental health.

**Background:** Psilocybin is the major psychoactive alkaloid found in some species of mushrooms available worldwide. Despite its experimental use during the 1960's there is a lack of recent evidence regarding its potential therapeutic benefits due to strong usage restrictions in multiple countries.

Nowadays there is a growing interest in the research of this alkaloids for the treatment of mental disease (anxiety, depression), however there is few evidence regarding its use for pain control.

**Methods:** Observational descriptive study. We present the case of a 93 years-old patient, with history of L4-L5 Severe LSS treated by laminectomy. The patient developed chronic lumbalgia and severe sciatica requiring oral drugs and transdermic fentanyl patch with inconsistent pain relief. No surgical treatment was feasible due to patient's comorbidities. Next-of-kin referred self-medication of 200mg each 72 hours of psilocybin. a 3-months follow-up period was proposed evaluating scales for pain (VAS), disability (ODI), anxiety and depression (DASS-21).

**Results:** After a 3 months follow-up period, 77% reduction in pain(VAS), 65% reduction in Depression-scales, 66% reduction for anxiety-scales was evidenced. However there was no relevant change in disability clinically relevant or measured by ODI-scale, (2% reduction).

No adverse event was identified by the patient or by the next-of-kin. The patient referred an improved state of mindfulness that allowed better tolerance to pain requiring lower doses of medications to achieve better pain control, as well as more intense spiritual experiences when practicing her faith improving her quality-of-life.

**Conclusions:** Psilocybin might be an alternative for pain treatment in those patients in whom is not possible to perform surgery.

Improvement in anxiety and depression may contribute to better pain control highlighting the relevance of a multidisciplinary approach of pain.

Controlled clinical trials are needed to obtain high-quality evidence.

## Neurovascular Surgery

ePoster presentation

### Differences between acute embolic and atherosclerotic middle cerebral artery occlusion in multiphase arterial spin labeling imaging

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**Objectives:** Arterial spin labeling magnetic resonance imaging (ASL-MRI) has become widely available for evaluating collateral development in acute ischemic stroke (AIS) patients. This study was aimed to characterize the findings of multiphase ASL-MRI between embolic and atherosclerotic large vessel occlusion (LVO) for the aids in differential diagnosis.

**Background:** It is important to identify the etiology of LVO in patients with AIS in order to determine the treatment strategy and predict patient outcome, despite differential diagnosis is still occasionally difficult because of the limited resources in acute phase.

**Methods:** Among 982 patients with AIS, 44 patients who diagnosed as acute, symptomatic, and unilateral occlusion of horizontal segment of middle cerebral artery (MCA) were selected and categorized into embolic stroke (ES) and atherosclerosis (AT) group. Using ASL-MRI (post-labeling delay [PLD] of 1.5, 2.0, and 2.5 seconds) at admission, the ipsilateral to contralateral ratio (ICR) of the signal intensity and the time-course increasing rate of ICR (from PLD 1.5 to 2.0 and 2.5,  $\Delta$ ICR) were measured and compared between two groups.

**Results:** The mean values of ICR were significantly higher in AT than ES group (AT vs ES: 0.49 vs 0.27 for ICR<sub>1.5</sub>, 0.73 vs 0.32 for ICR<sub>2.0</sub>, and 0.92 vs 0.37 for ICR<sub>2.5</sub>). The values of  $\Delta$ ICR of PLD 1.5 to 2.0 ( $\Delta$ ICR<sub>2.0</sub>) and 2.5 ( $\Delta$ ICR<sub>2.5</sub>) were also significantly higher in AT group than in ES group (AT vs ES: 50.9 vs 26.3% for  $\Delta$ ICR<sub>2.0</sub>, and 92.6 vs 42.9% for  $\Delta$ ICR<sub>2.5</sub>). Receiver operating characteristic (ROC) curves showed strong discriminative abilities of each ASL-MRI parameters in predicting the etiology of MCA occlusion.

**Conclusions:** Multiphase ASL-MRI parameters might aid to differentiate the etiology of intracranial LVO in acute phase. Thus, it can be applied to the management of AIS.

## Education, Ethics, Socioeconomic

ePoster presentation

Assessing the impact of neurosurgery and neuroanatomy simulation using 3D non-cadaveric models amongst selected African medical students

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**Objectives:** Assess the perception, attitudes and, impact of the UpSurgeOn hands-on-touch non-cadaver model training amongst selected Cameroon medical students.

**Background:** Laboratory dissections are essential to perform neurosurgical procedures. Despite being traditionally done on cadavers, they are often unavailable and suffer from cultural barriers in the African context. Non-cadaveric UpSurgeOn neurosurgery models have been developed to bridge this barrier, providing an almost similar experience with the human body.

**Methods:** An anonymous 39-item questionnaire was distributed online using Google drive systems to medical students who attended UpSurgeOn's hands-on-touch non-cadaver model training course.

**Results:** Eighty-six students completed the survey. The mean age was  $21.2 \pm 1.868$  years, 61.6% were males with 62.8% of respondents being medical students in preclinical years. Before the training, 29.4% had a fair knowledge of neuroanatomy. Textbooks were the main sources of neuroanatomy and neurosurgery knowledge for more than half of the respondents. Up to 91.5% had no prior exposure to a neuroanatomy/neurosurgery cadaver laboratory dissection, and 22.6% and 17.6% had witnessed and performed at least one craniotomy before, respectively. There were 11.1%, 15.5%, and 31.3% of our respondents who had used a surgical microscope, a neurosurgical instrument, and the UpSurgeOn Neurosurgery tool before, respectively. The majority perceived the UpSurgeOn tool easy to use and felt they needed to learn just a few things before getting going with the box. Most thought of increasing the use of the UpSurgeOn Box and saw the need to be part of the training curriculum. Finally, the majority felt this tool helped to increase familiarity and acquire neurosurgical skills, and to develop the orientation skills needed during neurosurgical approaches.

**Conclusions:** Exposure to traditional neurosurgery/neuroanatomy labs is limited in Cameroon. Most students found the UpSurgeOn tool user-friendly, saw the need to incorporate it as part of their training, and perceived it to be essential in getting acquainted with neurosurgical skills.

## Oncology

ePoster presentation

### Extramedullary intradural calcified meningiomas surgery in limited resources context: three cases report and literature review

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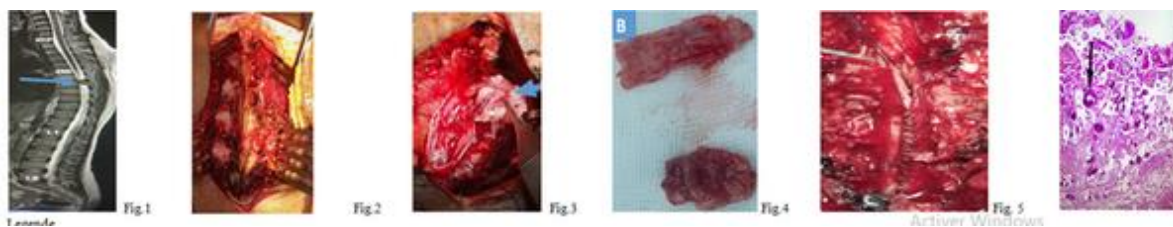
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**Objectives:** To explain the interest of an alternative technique for dural opening and tumor resection about calcified spinal meningiomas in our critical circumstances of the work.

**Background:** Spinal meningiomas are benign, slow-growing tumours, developed from arachnoidal cap cells. Calcified forms are about 1–5% of all meningiomas. Complete surgical removal of calcified spinal meningioma remains a true challenge in a context of limited resources without a neurosurgical microscope because of possible dural sac and nerve roots adhesions.

**Methods:** This is a three cases's report and literature review.

**Results:** Three patients were admitted in our Neurosurgery Departement for walking disturbances. The elderly patient had cardiomyopathy. Ct-scan and Magnetic Resonance Imaging objected to medullary compression by an intradural and extramedullary process. They benefited from spinal decompression through laminectomy and total macroscopic tumor resection according to Saito et al technique without neurosurgical microscope. This technique allowed to achieve a tight seal and prevent a cerebrospina fluid leakage. Histopathological analysis findings showed a psammomatous meningioma. The two young patients recovered total sensation and walking. The elderly patient died due to cardiac decompensati Fig.1



Legende

Fig.1: pre-operative MRI;

Fig.2: opening step;

Fig 3: Resection step;

Fig. 4: Calcified and soft tumors after resection;

Fig 5: Dural closure;

Fig.6: Histopathological image

**Conclusions:** These cases show the possibility of a complete recovery after a total macroscopic resection, even in a less elderly patient by using Saito technique without a neurosurgical microscope in limited resource context and the risk of the comorbidity in an elderly person.



## Trauma

Oral presentation

### Endoscopic management of traumatic CSF rhinorrhea: an institutional experience

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**Objectives:** The primary objective is to analyse the outcome of CSF rhinorrhea following skull base packing. The secondary objective is to look for the most common skull base defect.

**Background:** Post-traumatic CSF leaks are seen in 1% to 3% of all closed traumatic brain injuries (TBI) in adults and 80% to 90% of all the causes of CSF leaks in adult patients are due to head injuries. More than half of these CSF leak is presented within 48 hours of the trauma while almost all CSF leaks occur within 3 months in a delayed manner. Endoscopy is the treatment of choice for the management of CSF rhinorrhoea.

**Methods:** All the patients who underwent Transnasal endoscopic skull base packing with fascia lata in our institute over a period of 5 years were retrospectively analyzed, highlighting the location and size of the defect and outcome. A High-resolution CT brain with thin bony cuts was done, size and location of a defect were noted. Most patients were initially managed conservatively with acetazolamide and Lumbar puncture. Patients who failed to respond to conservative measures underwent endoscopic skull base packing.

**Results:** 100 cases of traumatic CSF rhinorrhoea that was endoscopically managed were included. Most of the patients were male and the mean age was 36.13 years. 12% of patients had associated symptoms and signs of meningitis. The frontal bone was the most common location, constituting 51.72%, followed by multiple defects involving more than one bone (22%). 18 patients (14.17%) had a recurrence, 14 patients responded to conservative management and 4 patients (3.14%) underwent repacking, 2 patients (1.57%) had recurrence after second packing. Successful resolution of rhinorrhoea is seen in 85.82% of patients.

**Conclusions:** Accurate localization of the site and size of the defect and packing with multilayered dural defect closure using a transnasal endoscope is the standard of care for traumatic CSF rhinorrhoea.

## Endovascular Neurosurgery

ePoster presentation

Usefulness of trans-forearm access for carotid artery stenting using the dual protection of flow reversal and distal filter

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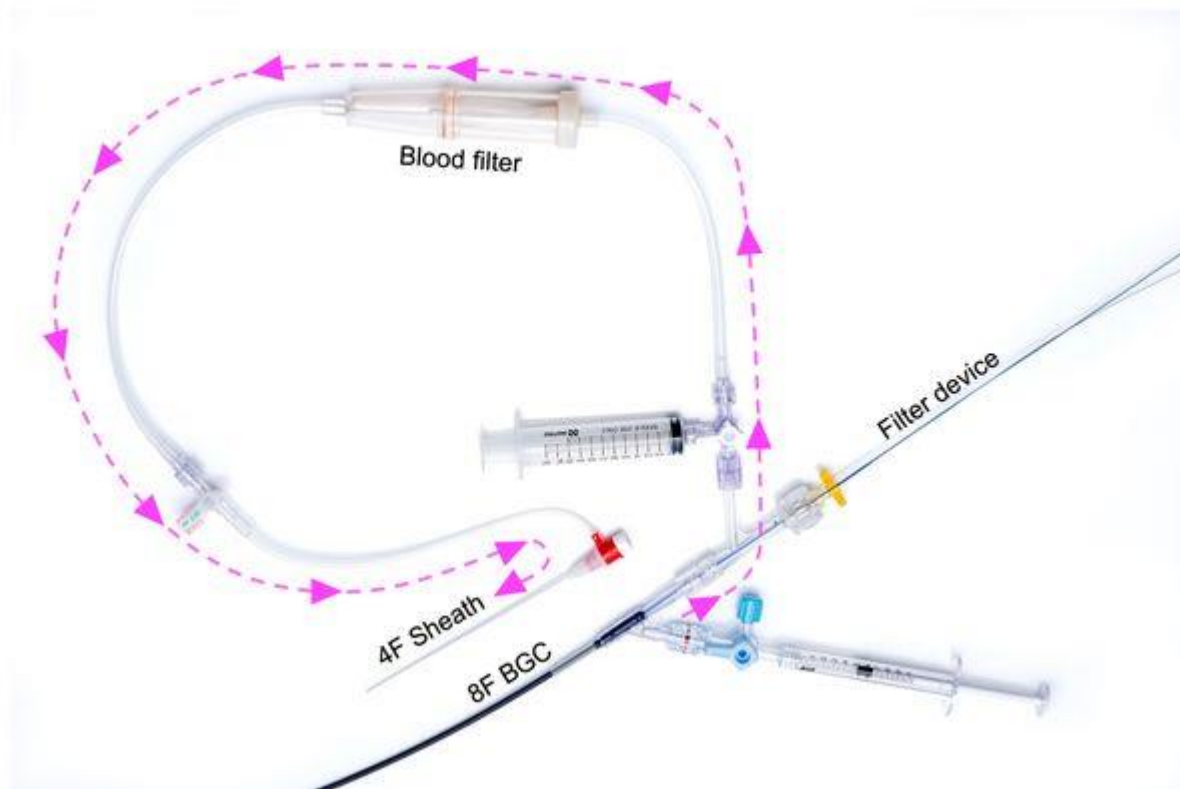
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**Objectives:** To minimize the risk of both embolic and access site complications, we devised a novel dual protection system with continuous flow reversal to the cephalic vein of the forearm in transradial carotid artery stenting (CAS), referred to as the “trans-forearm dual protection” technique. This study evaluated the feasibility and safety of CAS using this technique for carotid stenosis.

**Background:** Although transfemoral carotid artery stenting (CAS) is widely performed for carotid stenosis, serious or even fatal complications such as embolic and access site complications can still occur.

**Methods:** Between October 2022 and March 2023, 11 consecutive patients, who underwent CAS using the trans-forearm dual protection technique, were included in this study. A 4F short sheath was introduced into the right cephalic vein of the forearm. An 8F balloon guide catheter (BGC) was navigated into the common carotid artery (CCA) via right transradial sheathless approach. A distal filter protection device was placed in the high cervical internal carotid artery (ICA). The 8F BGC was inflated. To create an arteriovenous shunt from the CCA to the cephalic vein, the 8F BGC was connected to the 4F sheath in the cephalic vein with a blood filter interposed. Under the dual protection, the CAS procedure was performed using the standard technique. We retrospectively analyzed the procedural success,

and periprocedural or vascular access site complications.



**Results:** The dual protection system (6 right ICA, 5 left ICA; 8 symptomatic, 3 asymptomatic) and the subsequent procedure were successfully performed for all 11 patients without periprocedural or vascular access site complications.

**Conclusions:** The trans-forearm dual protection system was successfully utilized in all 11 patients without any complications. The trans-forearm dual protection technique can be a useful therapeutic option for CAS.

## Oncology

ePoster presentation

Relationship between connectome and intraoperative stimulation mapping in maximizing safe resection of low-grade gliomas

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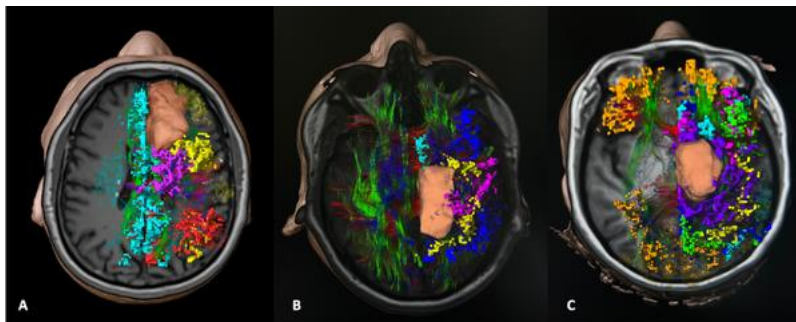
**Objectives:** To describe the correlation between connectome and stimulation-guided motor mapping in patients with low-grade gliomas.

**Background:** Gliomas are the most common primary tumors of the central nervous system. With the help of MRI, it is possible to create a structural map of the brain networks that can provide more accurate information about the anatomy in the context of a glioma, which is significant during surgery.

**Methods:** A prospective single-center case series of three patients with WHO low-grade gliomas attending the National Institute of Neurology and Neurosurgery in Mexico City was conducted. Custom brain connectomes were generated in accordance with the Human Connectome Project protocol. MRI with diffusion tractography was performed. An awake craniotomy was performed after neuropsychological testing. The maximum safe resection was guided by neuronavigation and intraoperative subcortical stimulation.

**Results:**

A total of 3 patients were described: male (66.6%), mean age of 44.6 ( $\pm 14.4$ ), with diagnosis of low-grade glioma, right location (100%), including frontal and parietal. Tumor uptake of fluorescein was not observed. Total (33.3%) and subtotal (66.6%) resections were documented because of positivity in motor mapping. Immediate postoperative hemiparesis was reported in one patient.



**Conclusions:**

Intraoperative stimulation improves functional outcomes of maximally safe resection. The connectome showed good correlation with cortical stimulation of the motor areas. Despite partial resections in  $\frac{2}{3}$  of our series, it is important to objectify this functional mapping prior to surgery, particularly in low-grade tumors, to avoid sacrificing function to obtain total resections. The neuroplasticity and cortical remodeling of these lesions generally allow for reintervention. The use of the connectome in individuals who are not candidates for awake surgery may be a safe alternative for preserving motor function in tumors involving eloquent areas. However, additional studies are necessary to rule out or confirm these results.

## Skull Base

ePoster presentation

### TSH-secreting pituitary tumors: a case series and literature review

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**Objectives:** To present a series of 3 patients with TSHomas and a brief literature review.

**Background:** TSH-secreting pituitary neuroendocrine tumors (PitNETs) account for <1% of all adenomas observed in surgical series. Most are macroadenomas, and diagnosis can be delayed by up to 9.5 years. Early diagnosis and appropriate treatment can prevent the occurrence of neurological and endocrinological complications. Surgical resection is the first-line treatment. A literature review will be presented to summarize current evidence.

**Methods:** A retrospective multi-center case series of three patients with confirmed histopathologic and immunohistochemical diagnosis of thyrotropin-secreting PitNET. Information was obtained from physical and electronic records.

**Results:** Three patients were described: male (100%), mean age 34 ( $\pm$ 9) years, with a diagnosis of TSH-secreting PitNET and macroadenomas (100%). The mean tumor volume was 12 cm<sup>3</sup>. Transsphenoidal endoscopic surgery was performed in 66.6% of the patients, one of whom underwent partial resection and required adjuvant radiosurgery. One patient refused the surgical procedure and was offered radiosurgery as initial therapy. Remission was achieved at 100%.

**Conclusions:** Thyrotropin-secreting pituitary adenomas are an uncommon cause of hyperthyroidism. Presurgical treatment with somatostatin analogs might be effective in reducing TSH-oma size. Surgery can effectively restore euthyroidism (>80%). Radiotherapy is an alternative treatment option. The T3 suppression test is the most sensitive and specific test for confirming complete removal of the adenoma. Recurrence appears infrequent.

## Neurovascular Surgery

ePoster presentation

### Microsurgical management of brain arteriovenous malformations (AVMs) with limited resources in Myanmar

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**Objectives:** The main objective was to describe microsurgical management of brain AVMs, admitted at North Okkalapa General Hospital, Yangon, Myanmar with limited resources and to determine the outcome of patients.

**Background:** Among 150 cases of hemorrhagic stroke in single center, incidence of brain AVMs was 5-10 / year and operated 3-5 / year during study period.

**Methods:** The prospective study was conducted from December 2016-2020. Total 16 patients were selected to detect clinical presentation. The results are based on collected data including imaging studies and analyzed to determine outcomes after surgery, follow up data.

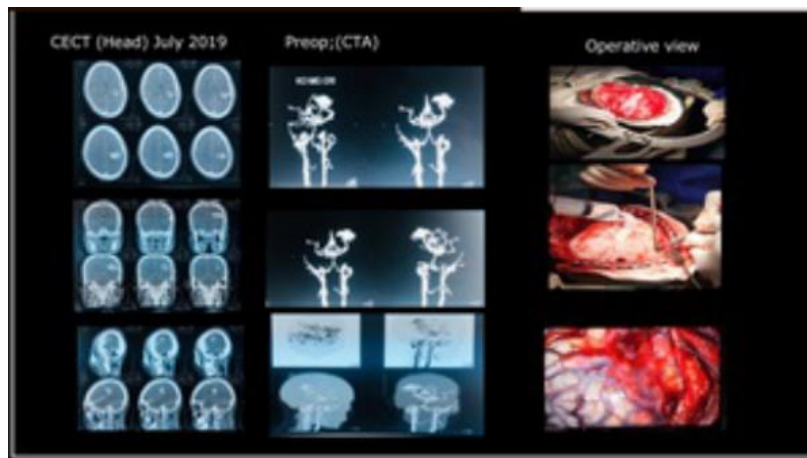
**Results:** There were 9 males (56.25 %) and 7 females (43.75 %) with 8-57 years of age group and 13 (81.25 %) with cerebral hemorrhage (the most common presentation) and underwent CT angiography. Another 3 (18.75 %) presented with seizures and headaches.

According to this study, Spetzler-Martin Grade II (50% ) was the commonest in 8 and Grade III (31.25%) in 5. Frontal AVMs (12 cases) were the most common (75%). The follow up duration was 36 months.

All patients underwent elective microsurgical operation, complete resection was achieved in 14 (87.5 %) and 2 (12.5%) had residual and recurrent because of high grade (IV, V) associated with calcification.

Among 16 patients, outcomes were better for the patients with AVMs smaller than 3 cm in 13 cases (81.25%).

Postoperative complication (12.5%) was presented with the significant neurological deficits and recurrent in Grade IV AVM with calcification (12.5%) in 2 years after operation.



**Conclusions:** Outcome of microsurgical management for brain AVMs was determined. Microsurgical management can achieve high cure rate even in the hospital with limited facilities for urgent cerebral angiogram and DSA and no facilities for intraoperative angiography.

## Oncology

ePoster presentation

Research on the expression of MGMT and polymorphisms of IDH1, IDH2 in human glioblastoma tissue

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**Objectives:** The aim was to investigate IDH1/2 polymorphisms and MGMT expression in glioblastoma postoperative samples using calibration graphs based on the MGMT standard in the form of the plasmid 17 ADVH2C-MGMT-pMA-RQ.

**Background: Objective:** Glioblastoma - the most common and dangerous primary brain tumor. Today, special attention is focused on a number of important molecules in terms of improving prognosis and therapy. These include IDH1, IDH2, and MGMT.

**Methods:** Excised tumors were studied histopathologically according WHO tumor classification. Using Applied Biosystems kits, RNA extraction was performed (PureLink RNA Mini Kit), cDNA synthesis was conducted (Tag man reverse transcription reagents kit), MGMT expression was determined (Hs01037698\_m1 kit), and IDH1/2 polymorphisms were identified (IDH1: rs121913500, IDH2: rs121913503 kits). MGMT expression was measured in double repeat using a calibration graph based on plasmid 17 ADVH2C-MGMT-pMA-RQ. Calibration amplification used  $10^2$ - $10^7$  standard copies.

**Results:** Among the analyzed samples, 39 were identified without IDH1/2 polymorphisms and three heterozygotes. The study showed a wide range of MGMT expression (1.7-88270,2 copies of MGMT per 1000 cells). It is conditionally possible to distinguish low or absent MGMT expression levels: 1.0-1000.0 copies of MGMT per 1000 cells (33.3%); elevated levels of 1000.0-10000.0 copies of MGMT per 1000 cells (28.2%); high levels (>10000 copies of MGMT per 1000 cells (38.5%). Patients with low (1.0-1000.0) MGMT expression levels are candidates for alkylating agent therapy, while patients with MGMT expression exceeding 10000 copies per 1000 cells can expect low effectiveness of such therapy.

**Conclusions:** The obtained data indicate the feasibility of determining MGMT expression using qRT-PCR with calibration based on the MGMT standard. This approach allows bypassing the regulatory steps that exist before mRNA synthesis and can improve the evaluation of MGMT expression. To validate the method, correlation between MGMT expression and clinical results of alkylating agent treatment is necessary.

## Trauma

Oral presentation

### Survival following craniectomy in intracranial gunshot wounds: a propensity-score matched analysis

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**Objectives:** To assess the survival and in-hospital outcomes for patients with IC-GSW following craniectomy.

**Background:** Intracranial gunshot wounds (IC-GSW) are a common cause of mortality in the United States. Neurosurgery is primarily indicated for debridement and dural closure with surgical decompression in the setting of hemorrhage and hematoma causing significant mass effect. In the absence of these indications, the value of craniectomy for IC-GSW is debated.

**Methods:** The National Trauma Data Bank was queried from 2017-2019 for all patients with an IC-GSW. Propensity-score matching was performed between patients who received a craniectomy compared to those who did not based on demographics, comorbidities, injury severity, and insurance type. The effect of intracranial pressure was controlled for by matching based on the presence of midline shift, intracranial hemorrhage, or treatment with an external ventricular drain or intraparenchymal pressure monitor. Differences between the two groups in treatments and outcomes were compared using paired Student's t-tests and Pearson's chi-squared tests.

**Results:** A total of 2,242 patients matching the inclusion criteria were identified. Following propensity score matching, 189 patients in each group were identified. Patients in the craniectomy group received higher rates of any intracranial surgery (77.25% vs. 35.98%,  $p < 0.001$ ), surgical debridement (26.98% vs. 6.35%,  $p < 0.001$ ), and foreign body removal (31.22% vs. 20.63%,  $p < 0.001$ ). Subsequently, they experienced longer intensive care unit (12.92 vs. 7.2 days,  $p < 0.001$ ) and hospital lengths of stay (23.37 days vs. 11.69 days,  $p < 0.001$ ) and higher hospital complication rates, but significantly lower mortality rate (21.16% vs. 38.62%,  $p < 0.001$ ).



**Table 1.** Outcomes, hospital complications, and discharge disposition in patients receiving craniectomy vs. patients without craniectomy. Patients were propensity-score matched based on demographics, comorbidities, injury severity, and insurance type.

Variable	Paired T-Test or Chi-Squared Test		P-Value
	Craniectomy (n=189)	No Craniectomy (n=189)	
Death	40 (21.16%)	73 (38.62%)	<0.001*
Hospital Length of Stay (days)	23.25 ± 23.96	11.69 ± 15.11	<0.001*
ICU Length of Stay (days)	12.51 ± 12.16	7.20 ± 7.95	<0.001*
<i>Hospital Complications</i>			
Acute Kidney Injury	1 (0.53%)	1 (0.53%)	1.00
Alcohol Withdrawal	0 (0.00%)	0 (0.00%)	0.99
ARDS	1 (0.53%)	1 (0.53%)	1.00
Cardiac Arrest	9 (4.76%)	9 (4.76%)	1.00
CAUTI	3 (1.59%)	0 (0.00%)	0.08
Deep Vein Thrombosis	9 (4.76%)	3 (1.59%)	0.08
Myocardial Infarction	0 (0.00%)	1 (0.53%)	0.32
Other Complication	9 (4.76%)	11 (5.82%)	0.65
Pressure Ulcer	4 (2.12%)	1 (0.53%)	0.18
Pulmonary Embolism	4 (2.12%)	2 (1.06%)	0.41
Sepsis	0 (0.00%)	1 (0.53%)	0.32
Stroke/Cerebrovascular Accident	4 (2.12%)	0 (0.00%)	0.04*
Unplanned ICU Admission	13 (6.88%)	2 (1.06%)	<0.01*
Unplanned Intubation	5 (2.65%)	1 (0.53%)	0.10
Unplanned Reoperation	7 (3.70%)	3 (1.59%)	0.20
Ventilator-Associated Pneumonia	5 (2.65%)	4 (2.12%)	0.74
<i>Discharge Disposition</i>			
Home	24 (12.70%)	26 (13.76%)	0.76
Home Healthcare	4 (2.12%)	6 (3.17%)	0.52
Skilled Nursing/Intermediate Care	67 (35.45%)	36 (19.05%)	<0.001*
Rehabilitation	42 (22.22%)	28 (14.81%)	0.06
Hospice	3 (1.59%)	4 (2.12%)	0.70
Left Against Medical Advice	1 (0.53%)	1 (0.53%)	1.00
Other Disposition	7 (3.70%)	10 (5.29%)	0.46

ARDS = acute respiratory distress syndrome, CAUTI = catheter-associated urinary tract infection, CVA = cerebrovascular injury, ICU = intensive care unit

\* = significant

**Conclusions:** Craniectomy following IC-GSW conferred a significant survival benefit, even when controlling for the presence of mass effect at presentation. This may be explained by a prophylactic effect on the development of increased intracranial pressure later on in the hospital course.

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## Education, Ethics, Socioeconomic

ePoster presentation

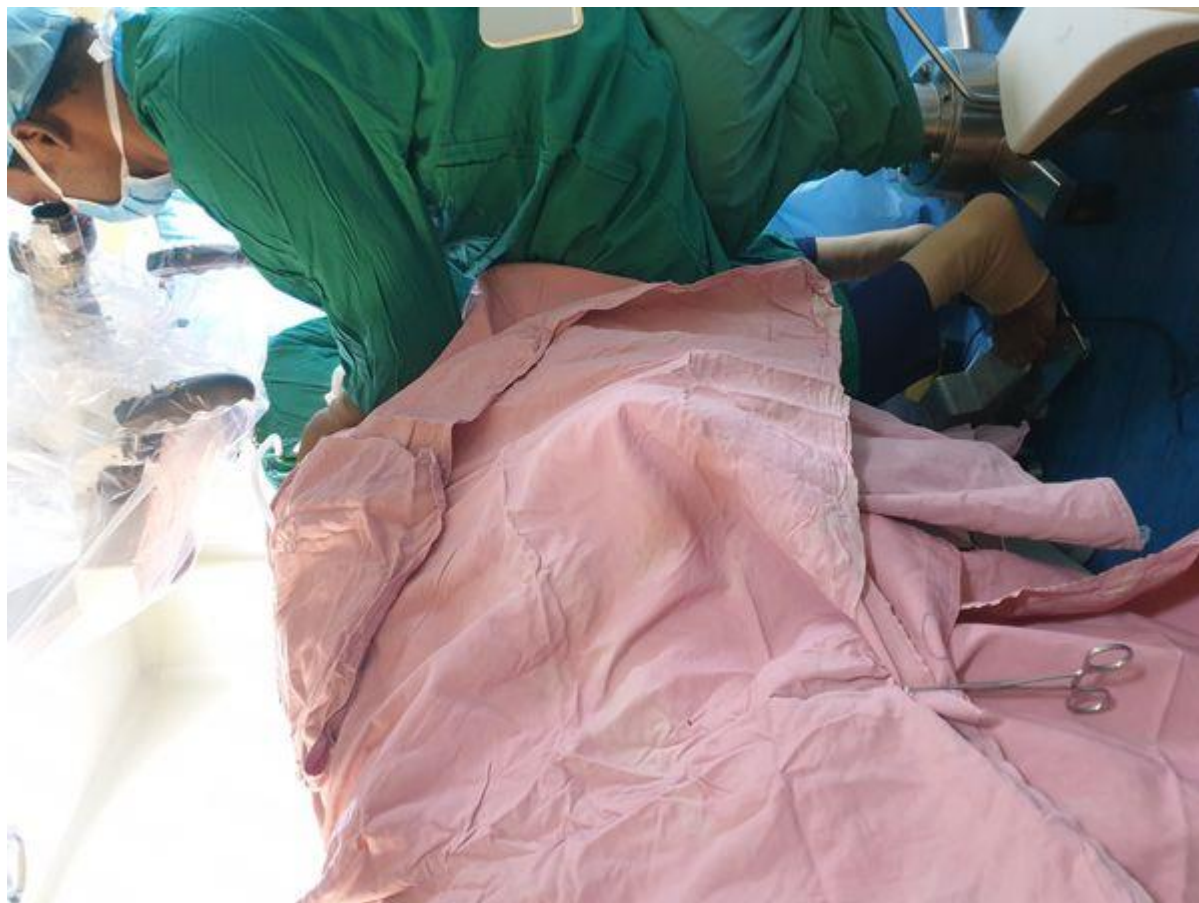
Foot adjustable/controllable suction in neurosurgical practice

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**Objectives:** Ease of surgery, Multifunctional modality use of suction cannula to do suctioning, retract the surrounding structures, and damage control. Incorporation of foot-controlled suction equipment in everyday neurosurgical procedures.



**Background:** Atraumatic suction in Neurosurgical practice is very essential and determinable pressure at the suction tip to do differential graded suctioning with complete surgeon autonomy. To do differential suctioning of CSF, blood, arachnoid, tumor tissue & vascular abnormalities and simultaneously safely retracting the surroundings and to proceed forward with meticulous neurosurgical procedures.

Thumb controlled suction irrigation system is not readily available in many neurosurgical centers across the globe.

**Methods:** This equipment is being used in a Neurosurgical institute in south India over the past decade and in a single surgeon center over the last 3 years successfully during all micro and endoscopic neurosurgeries. Owing to the versatility of the equipment surgeon can use it while sitting or standing during procedures. This enables even single surgeon centers to safely take up procedures.

**Results:** Increase in ease & autonomy of surgeon over the procedure. Atraumatic procedures being successfully done.

**Conclusions:** The foot controllable/adjustable suction apparatus is an indigenous cost-effective tool and a completely surgeon friendly system.

Proper controllable suction in micro neurosurgery is very essential and helps in good outcomes for the patients.

## Global Neurosurgery

Oral presentation

Practicing micro neurosurgery and skull base in limited resources areas and the importance of classical surgical approaches and techniques

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**Objectives:** The new technology and the minimal invasive, endoscopic or key hole surgical techniques and approaches can not replace our traditional and standard neurosurgical techniques but it can surely improve it.

**Background:** Neurosurgery in areas with limited resources and in which advanced tools such as navigation and intra operative MRI are not available , or even CUSA device, endoscopy, and intra operative neuro monitoring, these practice depends on traditional surgical approaches and techniques as only way to practice and save patients life.

**Methods:** In our center during the last three years, we performed about 250 microscopic neurosurgical procedures (one surgeon) without the availability of any of these advanced tools, mostly brain tumors , 40 cases of trigeminal micro vascular decompression .This experience proved to us that relying on traditional surgical techniques and approaches are the gold standard basis for the success of these operations we use standard steps like adequate bone removal of skull base, opening basal cisterns, opening sylvian fissure , and anterior clinedectomy for retractless surgery.

**Results:** Advanced tools can improve our practice of course because it can tells us where we are and how much tumor left for example , but it can not tells us what to do in brain swelling during surgery , and what is the safest way of dissection to protect the vital structures, or even gives us the accurate arachnoidal plan for safety dissection in meningiomas and other tumors surgery, but all these steps can be performed by our standard microsurgical approaches and can not be replaced by any modern tools or performed by what is called the minimal approaches and key hole and endoscopic surgeries.

**Conclusions:** Modern tools are very welcome to support our classical neurosurgical techniques but its not candidate to replaced it and these standard technique will stay the corner stone in our practice.

## Functional

ePoster presentation

### Unilateral digital clubbing in complex regional pain syndrome after brachial plexus injury: the neurovascular correlation and neurosurgical considerations

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**Objectives:** Report a complex regional pain syndrome (CRPS) type 2 associated with brachial plexus injury (BPI) and unilateral digital clubbing.

**Background:** CRPS is a debilitating condition characterized by chronic pain, sensory abnormalities, and autonomic changes. BPI can be one of the underlying causes of CRPS. Unilateral digital clubbing, a rare finding, and autonomic changes may also be present in CRPS but have received limited attention in the literature.

**Methods:** -

**Results:** Case report: A 38-year-old male patient was evaluated after sustaining a complete right BPI due to a motor vehicle accident. He exhibited lack of mobility, sensory deficits, and neuropathic pain in the affected extremity. Pharmacological management with maximum doses of tramadol and gabapentin proved ineffective, leading to the diagnosis of CRPS type 2. Surgical intervention was performed due to the refractoriness of the condition. During an evaluation at 6 months of follow-up, the incidental finding of unilateral digital clubbing was noted, along with autonomic changes such as pallor, edema, and decreased temperature. The significance of this finding extends beyond its rarity, as it suggests a potential mechanism associated with pain development in CRPS. The management usually focuses on controlling the inflammatory component through short-acting steroids. However, during the chronic phase, the prolonged release of endothelin-1 leads to vasoconstriction, a mechanism that could explain clubbing development because of hypoperfusion. For this reason, sympathetic blocks should be further explored as a potential treatment in these cases.

**Conclusions:** This case report highlights the association between CRPS type 2 and BPI, along with unilateral digital clubbing and autonomic changes. The proposed mechanism of chronic endothelin-1 release and hypoperfusion sheds light on the role of hypoxia as a potential contributor to pain development in CRPS. The findings highlight the importance of comprehensive management strategies for addressing the multifaceted nature of CRPS, including autonomic manifestations and vascular involvement.

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## Paediatric

ePoster presentation

Rib graft harvesting in paediatric population for an autologous cranioplasty, a proven safe way in public pediatric hospitals in Mexico

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**Objectives:** Emphasize the importance to recognize a relatively easy to learn and perform, resource-sparing and safe way to perform an autologous cranioplasty in paediatric population, even for large bone defects where the use of synthetic implants is not otherwise desirable nor advisable.

**Background:** Large bone defects in paediatric patients, regardless of the primary cause, has been always a special chapter inside paediatric neurosurgery since the options to perform a cranioplasty are not always as straightforward as in adult's counterparts and most of the times are age-dependent to make the final decision.

**Methods:** We performed an autologous right 8th and 9th rib costotomy in order to get an autologous curved bone graft up to 7 cm long to cover a right frontoparietotemporal defect of 10 cm long in an anteroposterior axis and 8 cm in superoinferior axis in a 3 years-old male who suffered a severe Traumatic Brain Injury which deemed a decompressive craniectomy one year before. The rib was split into two pieces to expand the covered area and were attached to the borders of the cranial defects with polyglycolic acid absorbable plates and screws. The patient was discharged the next day with no major blood loss nor added neurological deficit.





**Results:** The patient came to outpatient office revision three months later with an improved cosmetic of the cranial vault defect, adequate bone acceptance and a covered area of the defect >75% due to new native bone growth surrounding the graft.

**Conclusions:** Rib graft harvesting for autologous bone graft intended for a cranioplasty in children under 6 years old is a safe, easy to learn and economic way to take into account, which could be replicable in middle-income or even low-income countries with very few resources and excellent outcomes.

## Paediatric

ePoster presentation

A case report of congenital dermal sinus tract with dermoid cyst and lipoma

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**Objectives:** The authors report a case of congenital dermal sinus tract with dermoid cyst and lipoma.

**Background:** Congenital dermal sinus tract (CDST) is a rare entity of spinal dysraphism with an incidence of 1 in 2500 live births. The presumed etiology relates to a focal failure of disjunction resulting in a persistent adhesion between the neural and cutaneous ectoderm. CDST is commonly associated with other pathologies such as myelomeningocele, split cord malformation, tethered cord and inclusion tumors.

**Methods:** This case report was managed in the neurosurgical department of Gabriel Toure teaching hospital.

**Results:** This 2 year-old girl was admitted in our department with lumbosacral Congenital dermal sinus tract . She had no deficit. The preoperative MRI showed the dermal sinus tract with 2 intradural lesions from L1 to L3. The tract was surgically excised followed by complete excision of the cyst and lipoma. The post-operative course was uneventful.

**Conclusions:** Surgical excision of congenital dermal sinus tract is recommended as soon as possible to prevent complications secondary to infection.



## Paediatric

Oral presentation

### Inflammation disrupts networks of attention and executive function after pediatric traumatic brain injury: a pilot study

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**Objectives:** To examine relations between Osteopontin (OPN) during the first 72 hours of hospitalization and 1) attentional difficulties and 2) executive functioning (EF) at 6-12 months post-injury among pediatric patients with moderate-to-severe TBI.

**Background:** TBI elicits an inflammatory response that involves both resident and peripheral immune cells and is influenced by patient age, sex, mechanism and severity of injury, interventions, and genetic variability. OPN, an inflammatory cytokine, has recently been identified as a putative TBI blood biomarker. While adult studies have examined associations between neuroinflammation and neurocognitive outcomes in TBI, literature in pediatrics is limited.

**Methods:** Sample included 38 children with moderate-to-severe TBI: Mean age-at-injury= 10.61years (+/-3.62), 65.8%male; 55.3%White; lowest GCSmean=9.97. Outcome measures: parent reported Brief Rating Inventory of EF (BRIEF-2), Behavior Assessment System for Children (BASC-2) and digit-span forward (WAIS-IV and WISC-V). T-scores for BRIEF-2 and BASC-3 clinical scales and standard scores for digit-span were used in analyses. Plasma OPN was measured at hospital admission, 24h, 48h, and 72h after admission.

**Results:** Age and severity of injury were not correlated with outcome measures. Linear regression models revealed strong relations between OPN at 48 hours and BRIEF indices: Global Executive Composite ( $r^2=.503$ ,  $F(1,15)=15.17$ ,  $p<.01$ ), Behavioral Regulation Index ( $r^2=.490$ ,  $F(1,15)=14.39$ ,  $p<.01$ ), Cognitive Regulation Index ( $r^2=.426$ ,  $F(1,15)=12.87$ ,  $p<.01$ ), Emotional Regulation Index ( $r^2=.412$ ,  $F(1,15)=10.526$ ,  $p<.01$ ). OPN at 48 hours was related to attention difficulties: BASC Attention ( $r^2=.446$ ,  $F(1,15)=9.665$ ,  $p<.01$ ). OPN was not related to overt measures of attention (Digit Span forward). Other OPN time points were not statistically significant.

**Conclusions:** Pilot data suggest deficits in aspects of EF and attention were observed in patients with high levels of OPN. Our findings extend upon adult psychoneuroimmunology research to demonstrate preliminary evidence that children with TBI have increased neuroinflammation which in turn is associated with poorer EF and attention at 6-12 months post injury.

## Education, Ethics, Socioeconomic

ePoster presentation

How to help a trainee in difficulty?

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**Objectives:** To discuss common factors leading trainees in to difficulty and the ways to help them navigate through those.

**Background:** The author has been involved in supervision of neurosurgical trainees over the last three decades and this has been across the globe in three different continents. Author also has extensive experience of supervising junior doctors and medical students.

**Methods:** Working with trainees in formal supervisory and training roles, the author has kept himself abreast with the latest theories of adult learning. He has undertaken a formal qualification in postgraduate medical education. He also runs a course "Training the Trainers" for the Royal College of Surgeons across various centres. He has also taken additional responsibility to run webinars for the Faculty of Surgical Trainers to help address some of the issues.

**Results:** Various factors like (1) Human (2) System and (3) Clinical have been known to affect trainees and in a specialty like neurosurgery the stakes are quite high. It is important for trainers to have background training in the art/science of supervision and it is becoming increasingly common practice to implement certain standards by the governing bodies for those with such roles in postgraduate surgical/ medical training.

**Conclusions:** Author has been pro-active and finds it very rewarding to support those trainees in difficulty as the outcome is usually rewarding. This requires multidirectional approach and trainee centeredness is a fundamental tenant.

## Oncology

Oral presentation

Low-grade glioma imaging volumes and survival: a single-institution analysis of 103 patients after resection using intraoperative MRI

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**Objectives:** In this single-institution study of patients with LGGs who underwent resection using iMRI, we present a volumetric-based survival analysis to evaluate progression-free survival (PFS) and overall survival (OS) with a particular emphasis on initial tumor volume, impact of extent of resection and additional resection after iMRI on patient outcome.

**Background:** Intraoperative magnetic resonance imaging (iMRI) is a tool for maximizing resection of low-grade gliomas (LGGs) but the impact of this on patient outcome is not completely understood.

**Methods:** This retrospective analysis included patients with LGGs who underwent resection using iMRI from 2011 to 2021. Volumetric analyses of T2-weighted (T2W), and T2W fluid-attenuated inversion recovery (FLAIR) MRI sequences were assessed at preoperative, intraoperative, immediate postoperative, and three-month postoperative timepoints. Statistical analyses were carried out using log-rank and multivariable Cox proportional hazard regression analyses.

**Results:** A total of 103 patients (median age 36.0 years) were treated. We found statistically significant associations between greater EOR of both T2 and FLAIR volumes and longer PFS and OS on both univariate and multivariate analysis ( $p=0.03$  and  $p=0.04$ , respectively). Median EOR was 91%. Further resection was performed 52% of the time with 85% of the tissue from additional surgery demonstrating tumor. There was no observed association in either PFS or OS for patients undergoing additional resection after initial iMRI scan ( $p=0.67$  and  $p=0.98$ ). The results demonstrated significant associations between lower volume of preoperative T2W/FLAIR, intraop T2W/FLAIR, post op T2W/FLAIR and 3-month postoperative T2W FLAIR volumes with longer PFS and OS ( $p=0.016-0.001$ ).

**Conclusions:** Intraoperative MRI for low grade gliomas may help achieve high rates of extent of resection however further resection after MRI does not predict improved outcomes. Extent of resection and lower T2 and FLAIR volumes at all phases of preop, intraop and post op imaging were significant prognosticators with respect to PFS and OS.

## Neurovascular Surgery

Oral presentation

Risk factors for contrast induced encephalopathy post elective endovascular treatment of cerebral aneurysms: insights into patient characteristics and procedural factors

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**Objectives:** We present the world's largest case series of contrast induced encephalopathy (CIE) in patients post elective endovascular treatment of cerebral aneurysms. We aimed to explore patient characteristics, anatomical and procedural factors to determine risk parameters for the development of this serious complication which is becoming more prevalent.

**Background:** Neurotoxicity from iodinated contrast agents is a known but rare complication of neurovascular intervention. Neurotoxicity is thought to result from contrast penetrating the blood-brain-barrier with resultant cerebral oedema and altered neuronal excitability. To this date, there is a significant paucity in the literature with regards to risk factors for developing this condition limited to individual case reports.

**Methods:** This is a case series of 30 out of 500 patients who developed CIE between 2018 and 2023 post elective endovascular treatment of their cerebral aneurysms at an Australian tertiary neurosurgical centre with a 1 million population-catchment. Pre-operative variables included patient demographics, co-morbidities, and aneurysm characteristics. Intraoperative variables included type of contrast, volume of contrast, access site and surgical duration.

**Results:** Our data show a female predominance (83%) with a median age of 68 (range: 42-82). Patient co-morbidities (HTN, renal disease and smoking rates) were similar to non-CIE patients. Aneurysm location (86% anterior circulation) and access site (83% femoral) in CIE patients were also comparable to uncomplicated cases. Non-ionic contrast agents were used in all cases. The most prominent discrepancy was the mean duration of procedure and average volume of contrast used in CIE patients (300 min, 200 mls) compared with uncomplicated cases (90 min, 108 mls).

**Conclusions:** Our findings suggest that volume of contrast and length of procedure are potent risk factors for the development of CIE. Strategies to modify this in clinical practice, guided by further research, may help improve patient outcomes and reduce the incidence of CIE.

## Paediatric

Oral presentation

### Clinical characterization and outcome of open versus closed traumatic brain injury in pediatric population

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**Objectives:** 1. To determine the clinical characteristics of closed compared to open traumatic brain injury in children. 2. To assess the outcome of management of both closed and open pediatric traumatic brain injury using Glasgow outcome score.

**Background:** Pediatric traumatic brain injury (PTBI) is the leading cause disability and death and have distinctive pathophysiological characteristics different from that of adults, due age-dependent physiological and anatomical variations. Both closed and rarely open traumatic head injury could be seen in children but comparison between the two types of traumatic brain are not commonly done as such scientific evidence on characteristics and management outcome are scarce in literature. This study was design to unravel the clinical pattern and outcome of management of closed compared to open traumatic brain injury in pediatric population.

**Methods:** Retrospective analysis of cases of pediatric (<17 years) traumatic brain injury managed from January 2018 to December 2022. Bio-demographics and clinical features were noted and analysed; p-value set at <0.05.

**Results:** 251 cases managed over the study period with males constituting 74.1% with a male-to-female ratio of 3:1. The mean age was 8.4 years  $\pm$ 3.7 S.D. 57.7% managed non-operatively. Among the 106 (42.2%) that had surgical operation, 52.8% (56/106) were open PTBI while 47.2% (50/106) closed PTBI. The aetiology between closed and open head injury (road traffic crash,  $p=0.001$  and falls,  $p=0.036$  respectively). The higher the admitting GCS the better the outcome in both groups ( $p < 0.05$ ). Anaemia (haemoglobin < 10g/dl) is associated with poor outcome in closed PTBI ( $P=0.002$ ) but not open PTBI ( $P>0.05$ ). Full recovery was higher in open PTBI (50% versus 47%) while mortality (open-7.1%, closed-11.9%). Surgical site infection (open-8.9%, closed-1.9%).

**Conclusions:** Open traumatic brain injury compared to closed type was found to have variable aetiologies and management outcomes.

## Skull Base

ePoster presentation

### Endoscopic anatomy of the anterior communicating artery complex in relationship with the subcallosal area

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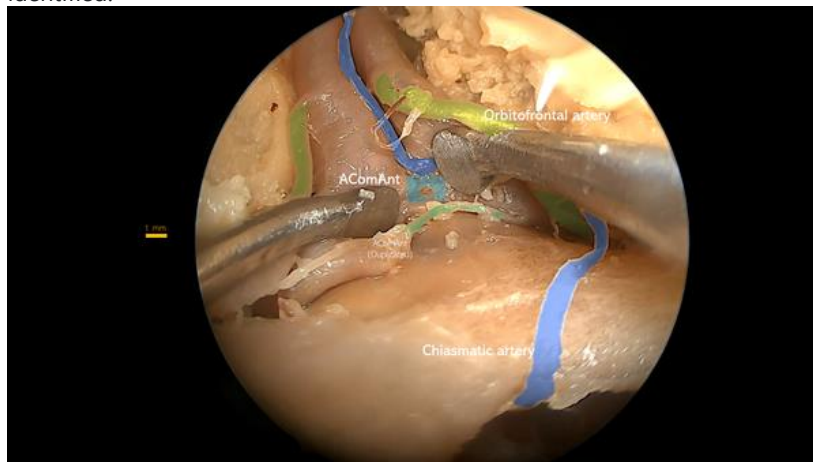
**Objectives:** Detailed description of the endoscopic anatomy of the communicating complex and its relationship with the subcallosal adjacent area.

**Background:** Serizawa's classification of the perforating arteries of the anterior communicating artery (AComA) includes hypothalamic, chiasmatic and subcallosal groups. Its importance has been widely described as they irrigate eloquent territories and few times are considered into surgical planning of approaches to lesions that occupy the subcallosal suprachiasmatic space including aneurysms and tumors, thus it is necessary to recognize in detail the endoscopic aspect of the anterior communicating complex (ACC).

**Methods:** Dissection of the anatomical structures in a cadaveric specimen in the Skull Base Lab in the Faculty of Medicine La Salle, Mexico City, from the transplanum transphenoidal trans gyrus rectus endoscopic approach ((Richard Wolf® ENDOCAM® Logic 4K/ 4 mm, 18 cm, Hopkins II, 0 and 30°; Karl Storz, Tuttlingen, Germany).

**Results:**

The mean working distance to the ACC was 91 mm, the AComA was found duplicated and with a central fenestration, the main branch was the subcallosal artery emerging as a common trunk from the dorsal-caudal aspect of the AComA, immediately bifurcated in 2 secondary trunks elapsing a cisternal pathway (2 cisternal branches) distally another bifurcation into 2 terminal groups well defined: one with medial direction towards the subcallosal adjacent area in between both hemispheres (group hypothalamic-chiasmatic) and other in dorsal direction to the pillars of the fornix and in between both sides of the lamina terminalis (group striatocortical-diencephalic). One chiasmatic artery was identified.



**Conclusions:** The identification of the most important branches of the ACC makes feasible to consider the endoscopic approach as a new option to this region as part of the armamentarium for the neurosurgeon.

## Trauma

Oral presentation

Impact of a large geographical area on outcomes in acute traumatic intracranial extra-axial haemorrhage requiring urgent surgical evacuation

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**Objectives:** To determine the impact of distance from treatment centre on time to intervention and long-term outcomes in acute traumatic extra-axial haemorrhage requiring urgent surgical evacuation.

**Background:** The Princess Alexandra Hospital (PAH) Department of Neurosurgery services a population of 1.85 million people over a 420,000 km<sup>2</sup> area in southern Queensland, Australia. Increased distance from a neurosurgical centre has previously been correlated with poorer outcomes in traumatic brain injury.

**Methods:** This single-centre retrospective study identified patients aged 16-85 who underwent evacuation of an acute traumatic subdural (ASDH) or extradural haemorrhage (EDH) between 2016 and 2022. Initial Glasgow Coma Score (GCS), pupillary abnormalities, time to intervention, distance from PAH and the Extended Glasgow Outcome Scale (GOS-E) at 6 months were recorded.

**Results:** 106 and 50 patients underwent evacuation of ASDH and EDH respectively. In the ASDH group, age was inversely correlated ( $p=0.03$ ,  $r^2=0.04$ ) and the motor component of the initial GCS was directly correlated ( $p=0.002$ ,  $r^2=0.09$ ) with GOS-E at 6 months. Distance from PAH directly correlated with an increased time to intervention ( $p<0.0001$ ,  $r^2=0.23$ ) but did not correlate with GOS-E at 6 months ( $p=0.09$ ). There was no difference between survivors and non-survivors regarding distance from PAH ( $43.43\pm 75.05\text{km}$  vs.  $25.56\pm 41.32\text{km}$ ,  $p=0.15$ ) or time to operation ( $276.14\pm 192.77\text{mins}$  vs.  $217.40\pm 147.27\text{mins}$ ,  $p=0.08$ ). This was also found for survivors with poor (GOS-E <6) and fair (GOS-E  $\geq 6$ ) recovery at 6 months. In the EDH group there was no correlation between distance, time to operative intervention, age or initial motor score with outcomes at 6 months.

**Conclusions:** Whilst increased distance from the treatment centre correlates with increased time to surgical intervention for ASDH, it does not impact on survival or functional outcomes at 6 months post injury. For ASDH requiring urgent evacuation, increasing age and severity of primary brain injury are predictors of poorer long-term outcomes.

## Neurovascular Surgery

ePoster presentation

Facial nerve compression by a dolichoectatic vertebrobasilar artery – is there a need for an anteromedial transposition? A case report

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**Objectives:** This case report aims to emphasize the importance of utilizing an anteromedial vertebrobasilar artery transposition technique when addressing dolichoectatic vertebrobasilar vascular compression of the brainstem or cranial nerves.

**Background:** There are several transposition techniques for brainstem and cranial nerves vascular decompression. In rare cases of impingement by a tortuous and dolichoectatic vertebrobasilar arteries, the need for an anteromedial transposition is crucial for relieving symptoms.

**Methods:** We present a case of a 48-year-old female with a ten-year history of left-sided hemifacial spasm that was refractory to botulinum toxin injections and other medical management. Physical examination revealed involuntary, recurrent twitches of the left facial muscles. Magnetic resonance imaging revealed neurovascular contact between the left dolichoectatic vertebral artery and the facial nerve.

**Results:** Dolichoectatic vertebral artery transposition and macrovascular decompression was performed through a left retrosigmoid craniotomy. A lyophilized dura-mater sling patch was placed around the offending vertebral artery, which was then sutured to the petrous dura, thereby pulling the artery in a posterosuperior direction.

Neuromonitoring responses remained unremarkable. Total relief of the hemifacial spasm was achieved within two days after surgery, although the patient experienced transient hoarseness for the next two months, which fully recovered after physiotherapy and speech therapy. There were no other surgery-related complications observed.

**Conclusions:** This case underscores the significance of anteromedial transposition of dolichoectatic arteries toward the clivus, instead of posterosuperior vessel traction, to mitigate the risk of compromising lower cranial nerves. As described in the literature, there is an evolution of the technique towards an anteromedial transposition from an inferolateral surgical approach, there by adopting a gradual preference for the far-lateral approach.



## Education, Ethics, Socioeconomic

ePoster presentation

### Assessment of a neurosurgeon's hand position and posture using machine learning methods

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**Objectives:** The aim of this study was to evaluate freely available computer vision algorithms for determining the body and arm posture of a neurosurgeon.

**Background:**

Machine learning models effectively solve different neurosurgical tasks related to skill classification, object detection, and outcome prediction.

**Methods:** In a microsurgical laboratory, the main variants of correct and incorrect body and hand positions of the operating surgeon were simulated and video-recorded. The following algorithms were used for video data analysis: RTMPose, AlphaPose, OpenPose, and MediaPipe. The above algorithms were compared in terms of quality and speed. The number of key points identified by the machine learning model at which the model is confident in determining body and hand postures were defined as the estimated metrics. A threshold of 0.5 was chosen as the high confidence threshold.



**Results:**

The best results were obtained with the RTMPose algorithm. Recognition of the correct posture of the neurosurgeon (COCO Body2D dataset) was achieved in 94.2% of the key points. When assessing the correct posture of the neurosurgeon's hands (COCO WholeBody2D dataset), the median confidence level was 20.91 out of 21 keypoints (99.6% of keypoints) for the left hand and 18.45 out of 21 keypoints (87.8% of keypoints) for the right hand.

**Conclusions:** The RTMPose algorithm is a good basis for solving the problem of neurosurgical ergonomics evaluation, but it needs to be adapted to the data domain and an evaluation classifier should be developed.

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## Neurovascular Surgery

Oral presentation

"Instant 3D" angiography: generating 3D anaglyph videos from 2D rotational angiograms

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**Objectives:** Our goal was to develop a low-cost and easily distributable software for converting rotational angiograms into 3D stereoscopic videos, without additional hardware or altering acquisition techniques. We also aimed to quantify the logistics and feasibility of this method.

**Background:** Rotational angiography, often referred to as a "spin", is used in the diagnosis of neurovascular disorders and treatment planning. However, images are typically viewed in 2D. Although virtual reality systems allow clinicians to view and manipulate angiograms in 3D, they can be expensive and inaccessible to under-resourced healthcare systems.

**Methods:** Six previously acquired rotational angiograms from our institution were exported using screen-capture and smartphone-recorded footage. Custom-written code in MATLAB was used to process the videos and generate anaglyph videos by exploiting the inherently rotational nature of the angiograms.

**Results:** The exported videos are compatible with 2D displays and red-cyan 3D glasses. The stereoscopic effect can convey anatomical depth that is not visible on the 2D images. Processing time was 1.3 +/- 0.6 seconds per angiogram. The only associated cost was \$10 for red-cyan 3D glasses.

**Conclusions:** Our solution is an inexpensive and rapid method for translating 2D angiograms into anaglyph format. It is a novel technique that does not require advanced hardware and is readily deployable in a variety of low-income or low-resource settings.

## Trauma

ePoster presentation

### Prognostic performance of magnetic resonance spectrometry in patients with diffuse axonal injury; a prospective cohort study

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**Objectives:** This study investigated the predictive value of magnetic resonance spectrometry (MRS) for diffuse axonal injury (DAI) to determine the outcome of patients with DAI.

**Background:** Traumatic brain injury (TBI) is a global concern, and many people suffer from TBI. Magnetic resonance imaging (MRI) and computed tomography (CT) scan are the most applied modalities for patients with TBI. Still, no single neuroimaging modality can provide details of brain injury and predict the endpoints of patients. Determining the outcome of patients with brain injury has a valuable clinical impact and results in better management of patients.

**Methods:** This is a prospective cohort study on the patients with DAI in a 6-month period at a tertiary medical center. According to the eligibility criteria, the patients were enrolled into the study. The MRS was conducted at day 3 and 30 and the correlation of metabolites of MRS according to the GCS score of patients at day 3 and 30 was investigated to find out the prognostic impact of MRS in patients with DAI.

**Results:** Fifty patients with DAI, including 39 males and 11 females, were recruited. MRS of patients at days 3 and 30 was conducted and showed that the level of phosphocreatine ( $r=-0.56$ ,  $P<0.001$ ), NAA/choline ( $r=0.86$ ,  $P<0.001$ ), myoinositol ( $r=0.12$ ,  $P<0.001$ ), and hunter angle ( $r=0.59$ ,  $P<0.001$ ) at day three are significantly correlated with the GCS score of patients at day 30. Phosphocreatine ( $r=-0.84$ ,  $P<0.001$ ), phosphocholine ( $r=-0.86$ ,  $P<0.001$ ), NAA/choline ( $r=0.89$ ,  $P<0.001$ ), myoinositol ( $r=-0.75$ ,  $P<0.001$ ), and hunter angle ( $r=0.89$ ,  $P<0.001$ ) at day 30 are substantially associated with day 30 GCS score.

**Conclusions:** This study showed that the level of phosphocreatine, NAA/choline ratio, and hunter angle at day three are significantly correlated with patients' GCS on day 30. Our results documented that some metabolites can be used for determining the prognosis of patients with DAI, which can be helpful in the clinical setting.

## Neurovascular Surgery

Oral presentation

CERCAS trial – carotid endarterectomy and repeated carotid angioplasty and stenting for in-stent restenosis

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**Objectives:** Carotid endarterectomy (CEA) or carotid angioplasty with a stent (CAS) is used as secondary prevention in the treatment of carotid stenosis. Both carotid endarterectomy and carotid angioplasty are associated with restenosis in more than 6% (CAS 3,5 -14%).

**Background:** In-stent restenosis belongs to the frequent and potentially serious complication after carotid angioplasty and stenting in patients with severe carotid stenosis. In our study, we aimed to compare the safety and effectiveness of carotid endarterectomy with stent removal (CEASR) and repeat percutaneous transluminal angioplasty with or without stenting (rePTA/S) in patients with carotid in-stent restenosis.

**Methods:** Consecutive patients with carotid in-stent restenosis ( $\geq 80\%$ ) were randomly allocated to the CEASR or rePTA/S group. The incidence of residual stenosis after intervention, stroke, transient ischemic attack myocardial infarction and death 30 days and 1 year after intervention and restenosis 1 year after intervention between patients in CEASR and rePTA/S groups were statistically evaluated.

**Results:** Both interventions were safe, no vascular event was recorded periprocedurally, 30 days and 1 year after intervention. The implanted stent in carotid restenosis was successfully removed in all patients in the CEASR group. Only 1 patient in the CEASR group had asymptomatic occlusion of the intervened carotid artery within 30 days. One patient died due to COVID-19 infection in the rePTA/S group within 1 year after intervention. Residual stenosis after intervention was significantly greater in the rePTA/S group (mean 20.9 %) than in the CEASR group (mean 0 %,  $p = 0.04$ ). Nevertheless, residual stenosis of  $\geq 50\%$  was not detected in any patient in both groups. Restenosis ( $\geq 70\%$ ) after 1 year was non-significant more often in the rePTA/S group compared to the CEASR group (4 vs. 1 patient;  $p = 0.233$ ).

**Conclusions:** Both CEASR and rePTA/S seem to be effective and save procedures for patients with carotid in-stent restenosis.

## Skull Base

Oral presentation

The combined transpetrosal intertentorial approach: an anatomical study and comparison with the standard combined petrosal approach

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**Objectives:** To compare surgical freedom, petroclival and brainstem area of exposure and maneuverability for 6 anatomical targets between the standard combined petrosal approach (SCPC) and the combined transpetrosal intertentorial approach (CTIA).

**Background:** SCPC is an excellent method to access the petroclival region but has the inherent risk of injury to the temporal lobe and vein of Labbé. CTIA has the potential to greatly reduce these risks. In this study, the authors describe CTIA and perform a quantitative comparison between the SCPC and CTIA.

**Methods:** Five human specimens were used for this study. SCPC was performed on one side and CTIA on the opposite side. For the petroclival region, we identified 4 fixed anatomical landmarks (posterior clinoid process, Meckel's cave, internal acoustic canal, and jugular foramen) and 2 variables (uppermost and lowest medial clivus). For the brainstem area, we determined 2 fixed points (CN V and LCNs REZ) and 3 variable ones (the lowest medial brainstem, the uppermost medial, and lateral brainstem). A neuronavigation system was used to collect the surgical data of all the anatomical dissections.

**Results:** CTIA provided a smaller area of surgical freedom, but the areas of exposure for the petroclival region and brainstem were not statistically different between the two approaches. CTIA avoided temporal lobe exposure. The antero-posterior maneuverability for the oculomotor foramen (OF), Meckel's cave (MC) and the root entry zone (REZ) of the trigeminal nerve were similar. The supero-inferior maneuverability for OF, MC, Dorello's canal, and REZ of CN VII were significantly reduced when using the CTIA.

**Conclusions:** CTIA is an interesting alternative to SCPC that provides comparable surgical exposure for both the petroclival skull base and anterolateral brainstem, with significantly reduced exposure of the temporal lobe. It has the potential to reduce iatrogenic injury to the temporal lobe and basal temporal veins.

## Oncology

Oral presentation

### Interventional fluorescence lifetime imaging (iFLIm) for guiding resection of malignant gliomas

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**Objectives:** Integrate iFLIm imaging into glioma resection.

Test iFLIm discrimination of glioma from normal brain.

Assess iFLIm's potential to guide glioma resection.

**Background:** The outcome of patients with malignant gliomas improves with more complete tumor resection. Intraoperative navigation based on preoperative imaging is distorted by shift of brain and tumor during tumor exposure and removal. Intraoperative MRI is time consuming and only transiently accurate. Advanced classifiers of tissue type from iFLIm-derived parameters may better distinguish tumor from brain as tumor is resected.

**Methods:** iFLIm (excitation: 355 nm; emission spectral bands: 390/40, 470/28, 542/50 nm) was used to evaluate infiltrative edges of 15 wild-type glioblastoma multiforme (GBM) and 12 IDH-mutant gliomas (oligodendrogliomas, astrocytomas). iFLIm data were analyzed for tumor cell density, tissue infiltrated (gray/white matter), and history (untreated/recurrent tumor). iFLIm predictions (glioma, tumor-infiltrated brain, normal brain) about small (1mm) tumor portions were compared with H&E staining of specimens resected. Linear discriminant analysis distinguished areas of high and low tumor cell density and Wilcoxon rank-sum assessed significance of differences between histological classes.

**Results:** Regions of infiltration of untreated GBM into white matter showed a spectral red shift and fluorescence lifetimes that decreased as tumor cell density increased. Linear discriminant analysis distinguished areas of high versus low tumor cell density (ROC-AUC=0.74). IDH-mutant oligodendrogliomas exhibited shorter fluorescence lifetimes than IDH-mutant astrocytomas ( $3.3 \pm 0.1$  vs  $4.1 \pm 0.1$  nsec, respectively;  $p < 0.01$ ). Both IDH-mutant glioma subtypes had shorter lifetimes than white matter ( $4.6 \pm 0.4$  nsec;  $p < 0.01$ ).

**Conclusions:** iFLIm can be efficiently incorporated within the workflow of craniotomy for glioma resection and provides near-instantaneous *in vivo* evaluation of brain tissue, including identification of GBM infiltrative margins and prediction of genomic-based histology. Future integration of multiple data streams (iFLIm, preoperative MRI, patient-specific historical data) within an AI-enabled intraprocedural platform may provide real-time surgical guidance conducive to more complete tumor resection and better patient outcome.

## Trauma

ePoster presentation

### Chronic subdural haematoma - past, present and future

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**Objectives:** The author would like to share the changing concepts in the pathophysiology of this common neurosurgical condition and its influence on the management of the same.

**Background:** Chronic Subdural Hematoma is a common neurosurgical condition with increased incidence in the elderly. Provision of care for this condition is going to pose additional challenge due to advancing age of the population on one hand and use of antiplatelet/ anticoagulation medication on the other. While surgical management has been the mainstay of treatment for symptomatic patients, successful attempts have been made for treating a select group of patients with either conservative or minimally invasive options including endovascular intervention.

**Methods:** The author has a particular interest in management of this condition and hence been invited to give presentations at a national and international meetings on this subject. Extensive review of literature has been carried out to reflect deeper understanding of the natural history as well as the pathophysiology of Chronic Subdural Haematoma from the original description by Virchow in 1857. Subsequently, other theories based on osmotic pressure gradient across the haematoma membrane and recurrent bleeding from the haematoma capsule have been popularised. The advances in imaging coupled with our understanding of its pathophysiology has helped tailor our management options. Unfortunately, there is no uniformity about the surgical approaches giving variable outcome. The continuing quest for minimally invasive options to treat this condition has resulted in to recent surge in medical measures and endovascular methods. The future seems to be promising.

**Results:** Literature is flooded with the epidemiology, natural history, pathophysiology and management options for this common neurosurgical condition, which has baffled the neurosurgeons for decades.

**Conclusions:** The management of Chronic Subdural Haematoma has been largely influenced by our understating of it's pathophysiology and has changed significantly over the time with emphasis and availability of minimally invasive options.

## Spine

Oral presentation

Five-year outcomes following transforaminal endoscopic foraminotomy and discectomy for soft and calcified thoracic disc herniations

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**Objectives:** The aim of this study was to evaluate the safety and long-term clinical outcomes of transforaminal full endoscopic discectomy and foraminotomy performed with manual reamers under local anaesthesia on soft and calcified herniated discs in the mid and lower thoracic spine.

**Background:** Non-anterior approaches are preferred to access herniated discs in the thoracic spine. minimally invasive transforaminal full endoscopic technique for the treatment of thoracic disc herniations is slowly being adopted due to reduced postoperative morbidity and enhanced postoperative recovery.

**Methods:** Postoperative pain relief was self-evaluated by 16 patients using a visual analogue scale (VAS), and Oswestry disability index (ODI). Patients were scored at 6 months, 12 months, 24 months and 60 months after surgery.

**Results:** Significant pain reduction of more than 50% in the VAS score was achieved in 15 out of 16 patients at all review points throughout this study. Similarly, a decrease of more than 50% in ODI scores was achieved in 15 out of 16 patients in all four review points. There were no surgical complications. Good postoperative results were achieved in patients regardless the consistency of the disc herniation.

**Conclusions:** Transforaminal full endoscopic discectomy and foraminotomy with manual reamers performed under local anaesthesia produces sustained reduction in pain and improves functionality in patients with mid and lower thoracic spine soft and calcified disc herniations. The surgery is safe and straightforward to perform with the correct training.



## Oncology

ePoster presentation

### Rare subtype of glioblastoma: literature review and analysis of two cases of gliosarcoma

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**Objectives:** To describe the clinical, morphological and immunohistochemical features of two cases of gliosarcoma.

**Background:** Case 1: A 53-year-old male patient presented with one month of severe headache, associated with dizziness, anterograde amnesia, and seizure. Magnetic resonance imaging (MRI) revealed a left occipito-parietal solid-cystic lesion with mass effect, heterogeneous, and contrast enhancement.

Case 2: A 70-year-old female patient presented with right upper limb paresis and seizure. MRI revealed a lesion in the right precentral gyrus region. Both cases were treated with surgical resection of the lesion, and histopathological and immunohistochemical analyses confirmed the diagnosis of gliosarcoma.

**Methods:** The cases were selected at a service in the metropolitan region of Curitiba in the year 2023. Histological and immunohistochemical studies were performed.

**Results:** Gliosarcomas (GS) are a rare subtype of glioblastomas (GBM), accounting for 2% of cases. They are more prevalent in male patients between 40 and 60 years old. The clinical presentation is identical to other gliomas, with a predilection for the supratentorial compartment and a focus on the temporal lobes. Often, they assume a more peripheral location with the possibility of adhesion to the dural sinuses and on cranial computed tomography (CT), they can resemble meningiomas. The prognosis is unfavorable due to rapid expansion and a median survival of six months. The histopathological characteristics demonstrate a bifasic composition of glial and sarcomatous cellular groups, which are not always precisely identified.

**Conclusions:** Gliosarcoma is a highly malignant neoplasm that, although rare, should be included in the differential diagnosis of other intra-axial neoplasms in the central nervous system. The importance of immunohistopathological analysis, as well as molecular genetics, is emphasized for the correct diagnosis of these lesions and to facilitate appropriate therapy that may modify the currently restricted prognosis.

## Global Neurosurgery

Oral presentation

### Frontal aslant tract mapping during glioma surgery

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**Objectives:** The Frontal Aslant Tract (FAT) connects the supplementary motor area with the pars opercularis of the frontal lobe. Its role in language and its implication in glioma surgery remain under discussion. In the present study, an analysis of three surgical cases is presented, as well as an anatomical study using tractography and cadaveric dissections.

**Background:** Different studies have assessed the function of the FAT in the dominant hemisphere and have shown its involvement in speech initiation, verbal fluency, and semantic word decision, so neurosurgeons should try to identify and preserve this tract during left frontal lobe surgery, to ensure the maintenance of language functions.

**Methods:** Three patients with left frontal lobe gliomas were operated with awake surgical protocol, using cortical and subcortical mapping techniques as well as performing motor and language evaluations. Tractography was performed with the DSI Studio software. The laterality index was calculated and its statistical significance was confirmed with a Student's t-test. The results were compared with cadaveric dissections performed in 12 hemispheres using the Klingler technique.

**Results:** All three patients presented intraoperative inhibition of language by subcortical FAT stimulation. Resection in contact with the FAT correlated with language deficits in all cases and deficits in movement initiation in 2 cases. Six months after surgery all patients had recovered their deficit. Regarding its anatomical structure, the tract is made up of six projections. We have verified the presence of commissural fibers, defined cingulate and insular connections, verified striatal connections and even added new frontal projections to the previously known structure.

**Conclusions:** The FAT represents a connection between the SMA, language and movement initiation areas. Its neurosurgical-cognitive implication, in relation to its postsurgical deficit, is still under discussion. We were able to reconstruct the tract, specifying its morphology and studying its intra and interhemispheric connectivity.

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## Spine

ePoster presentation

### Avoiding lumbar fusion with a small endoscopic partial discectomy: long term follow-up

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#### Objectives:

- 1) Determine if fusion pathway patients could avoid fusion.
- 2) Follow-up on the result for those patients avoiding fusion.

#### Background:

- This study was done to determine if patients that had lumbar fusion recommended by surgeons could avoid fusion over the long term.

#### Methods:

- Our study group of 68 patients all had lumbar fusion recommended by surgeons that were ready to perform the fusion. These 68 patients.
- all chose to have a small endoscopic partial discectomy instead. We did a retrospective analysis with email and phone follow-up, 68 patients responded. Success was defined as avoiding fusion over the long term, 88%.
- 68 patients - 24 female - 44 male Aged 21 to 89 - Average age 45.25

Primarily low back pain = 15 % Objective radiculopathy = 85 %.

Average follow up 45.6 months.

**Results:** 12 patients had further surgery. Of those 8 had fusion (11.8 %) and 4 had laminectomy or decompression. Overall 17.6 % had some form of further surgery. There were no complications and none of these subsequent operations were done within a year after the small endoscopic procedures.

Analysis of the failures showed that they did not have pure disc pathology. They had disc pathology and also significant bone, joint and ligament changes.

**Conclusions:** More alternatives to spine fusion have become available in recent years. These include endoscopic procedures that range in size from small to large. The smaller scopes do not allow drilling and therefore are limited to disc removal. This makes patient selection and matching to the correct equipment important.

## Oncology

ePoster presentation

### Insular glioma surgery

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**Objectives:** The role of surgery for insular gliomas has illustrated the importance of maximal extent of resection to increase overall and progression-free survival. In order to achieve this with low morbidity profiles, extensive preoperative assessment and different intraoperative techniques are employed. The objective of this article is to present our experience and technique regarding insular glioma surgery.

**Background:** The insula constitutes an interface between the neocortex and the limbic system, and bears extremely complex anatomical relationships with the overlying eloquent cortices, white matter tracts and critical vascular structures.

**Methods:** Retrospective and monocentric study of a cohort of adult patients who underwent surgery for insular gliomas by the same neurosurgeon between 2012 and 2022. Neuronavigation with integrated tractography were used. Neurophysiological tools include motor and somatosensory evoked potentials monitoring and mapping of cortical and subcortical eloquent areas.

**Results:** A total of 36 patients were included with a mean age of 38 years. The location was right in 16 cases (44%) and left in 20 (56%). The most frequent clinical presentations were seizures in 23 patients (64%) and neurological deficits in 7 (19%) cases. Surgery was performed in awake conditions in 14 (40%) patients for motor mapping and in 12 (33.6%) patients for language and motor mapping. We evidenced intraoperative seizures in 3 cases (8.3%) Eighteen patients presented postoperative speech disorders, with complete and partial recovery at 3-months in 55% and 33% respectively. Regarding motor function, 17 patients presented postoperative deficits with 3-months complete recovery in 70%, partial in 18%, and no improvement in 12%.

**Conclusions:** Surgery for insular gliomas is a complex task that needs to be managed with adequate preoperative and intraoperative assessment in order to achieve maximum safe resection at the expense of a low morbidity. Motor and somatosensory evoked potentials monitoring and subcortical white tracts mapping can optimize surgical results.

## Neurovascular Surgery

ePoster presentation

Is clipping of the cerebral aneurysm still relevant in 2023

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**Objectives:** To determine the relevance of intracranial aneurysm clipping safety in era of endovascular treatment.

**Background:** The clipping of the intracranial aneurysm has been the sole treatment for more than 8 decades until 3 decades ago, when endovascular treatment was introduced. Since then the endovascular treatment has been growing and is currently the usually preferred method in 21century.

**Methods:** The retrospective study.

**Results:** We operated 62 patients (14-71 and one 92yrs). Most were between 40 -60yrs (51%). The youngest was 14 yrs, whilst 14-38 yrs (20%).Sixty percent of the patients were females. More than 95% did excluding the first 5. Most of the patients with ruptured and unruptured aneurysm were discharged home on day 3 post operation.

**Conclusions:** Clipping of the intracranial aneurysm is occasionally the mere method of treatment or after the failure of endovascular route. Albeit not competing with endovascular coiling. It is just an art not be lost and still relevant in 2023, particularly in areas remote from cities.

## Endovascular Neurosurgery

ePoster presentation

Measurement and comparison of mechanical stiffness of stent delivery systems for carotid artery stenting: an experimental evaluation

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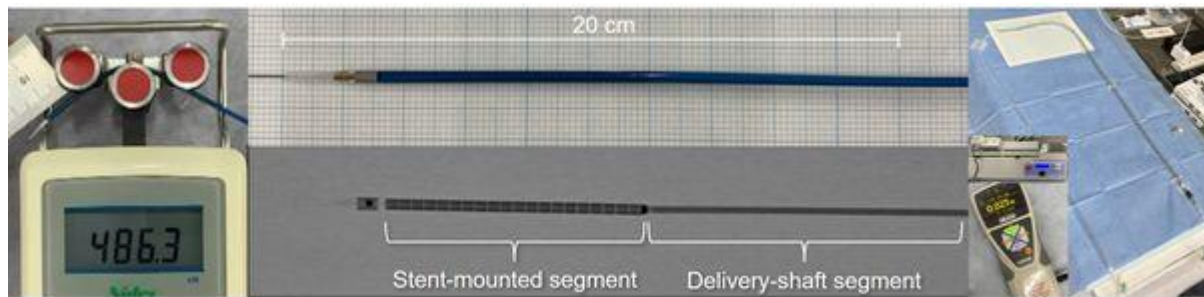
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**Objectives:** To evaluate the mechanical stiffness (i.e., flexural stiffness and trackability) of the stent delivery systems, bench-top experiments were conducted.

**Background:** A stable guiding system is mandatory for successful carotid artery stenting. However, in patients with unfavorable tortuous vascular geometries, the guiding system has a potential risk to prolapse into the aortic arch during stent advancement. Nevertheless, there is a lack of evidence on the mechanical stiffness of the carotid stent delivery systems.

**Methods:** Five delivery systems (Casper, Precise, Protégé, Protégé Tapered, and Wallstent) were included. The flexural stiffness was measured by three-point bending test for the part within 20 cm from the tip of the delivery system, including stent-mounted and delivery-shaft segment (left and middle images). The trackability was evaluated by measuring the resistance of the delivery system as it passed through the 6F guiding sheath placed in the artificial vessel model with 90-degree bend (right image).



**Results:** The flexural stiffness of the stent-mounted segment was 85–118 cN in Casper, 381–432 cN in Precise, 508–544 cN in Protégé, 460–550 cN in Protégé Tapered, and 260–340 cN in Wallstent; the closed-cell stents had lower flexural stiffness than the open-cell stents. The flexural stiffness of the delivery-shaft segment was 117–768 cN in Casper, 280–712 cN in Precise, 287–579 cN in Protégé, 312–633 cN in Protégé Tapered, and 120–180 cN in Wallstent; there were wide difference in the delivery-shaft segment. The results of trackability correlated with those of the flexural stiffness in all five delivery systems; the higher the flexural stiffness, the higher the resistance during delivery system advancement.

**Conclusions:** The mechanical characteristics showed unique variation among the delivery systems. These findings can contribute to successful stenting, especially for patients with unfavorable vascular geometry.

## Hydrocephalus

Oral presentation

Do CSF proteins levels affect ventriculoperitoneal shunt survival in hydrocephalus?

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**Objectives:** To demonstrate the effect of CSF proteins on ventriculoperitoneal shunt survival

**Background:** Ventriculoperitoneal shunts frequently malfunction with up to 30-40% of VP shunts failing in the first one year after insertion. The commonest cause of shunt failure is shunt blockage. Elevated CSF protein have been hypothesized to lead to shunt blockage.

**Methods:** This was a prospective cohort study. Patients were recruited into the study following VP shunt surgery for hydrocephalus. Based on their baseline CSF proteins, the patients were divided into two groups; those with normal and those with elevated CSF proteins. Patients were then be followed up in the neurosurgical clinics for a period of 3months during which shunt function was assessed clinically. This data was then entered to the statistical package for social sciences (IBM SPSS statistics 25.0) for data analysis.

**Results:** A total of 82 patients met the inclusion criteria and were recruited into the study. Forty-six (56.1%) were male while 36(43.9%) of them were female. The mean age was 15.5 months. The shunt failure rate at 3 months for this patient cohort was 9.8%. The incidence of shunt failure in the patient group with elevated CSF proteins at 3 months post-insertion was 20%, while the incidence of shunt failure in the normal protein group was 2.3%. From the findings of this study, elevated CSF proteins increase the likelihood of shunt failure in the first 3 months after insertion by 8.7 times. It was further observed that the protein concentration among the patients that developed shunt failure was 1250mMols/L compared to a mean protein concentration of 545mmol/L in the patients whose shunts were functional at 3 months.

**Conclusions:** Elevated CSF protein concentration was associated with an increased likelihood of ventriculoperitoneal shunt failure by 8.7 times.

## Oncology

ePoster presentation

### Role of molecular profiling as predictive and prognostic factors for gliomas

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**Objectives:** 1. To Include Molecular Markers alongside Histological features to precisely grade the Gliomas.  
2. To Utilize IDH testing to prognosticate outcome & predict responses to treatment.

**Background:** Historically, and even today Glioma Surgery has been a cornerstone of neurosurgery. Practically as well, it forms a significant part of Neurosurgeon's practice. Even though the concept of "SAFE MAXIMAL RESECTION" is still carried onto from the historical era, the overall treatment approach of Glioma is modernizing. Although histopathological grades remain useful, the prognoses of patients with glioma are more closely associated with molecular alterations compared with grades. Given the rapid progress in neuro-oncology, there is an requirement to increase the understanding of the pathology and taxonomy of glioma, to improve the selection of treatment options for patients and to develop novel therapeutic strategies.

**Methods:** A prospective study with Sample size of 48 patients was conducted at B J medical college and civil hospital, Ahmedabad, Gujarat, India from August 2018 to January 2021.

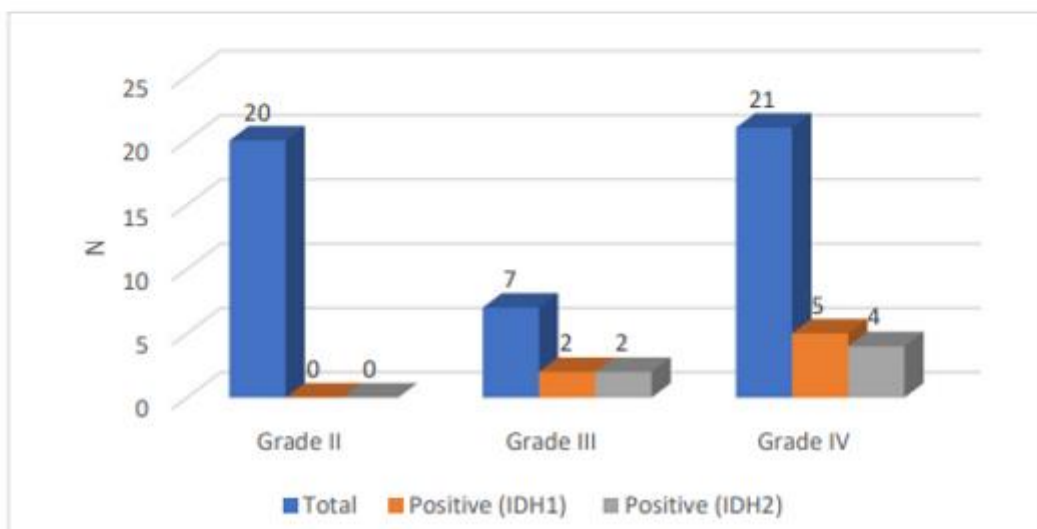
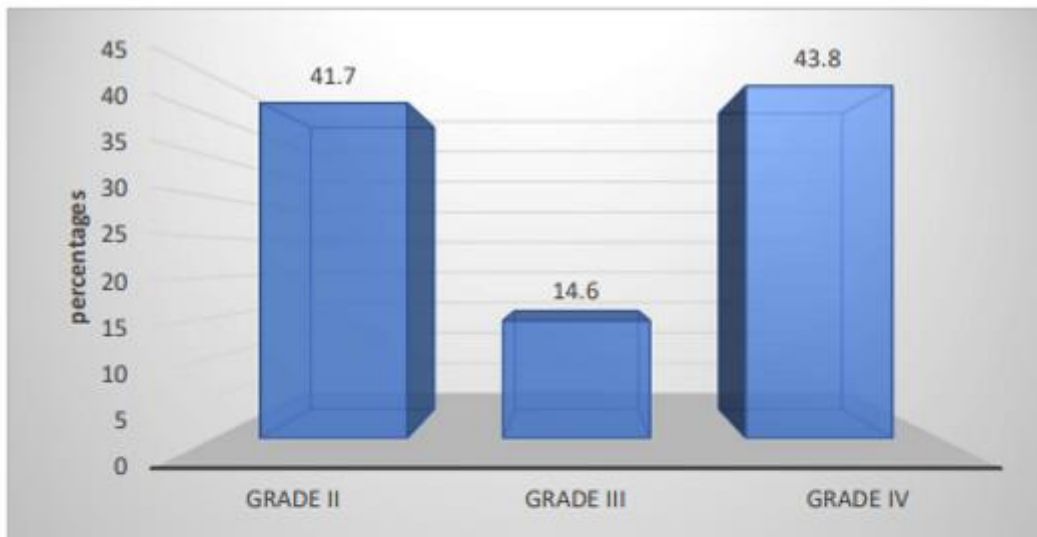
Inclusion : Patients aged > 18 years with grade II to IV were Included.

Exclusion: Pediatric patients < 18 years, Grade I tumors and Low GCS score (<8) were excluded from the study.

**Results:** Histopathological grade II was 41.7%, grade III was 14.6% and grade IV was 43.8%.

Out of 7 grade III patients, 2 patients were IDH 1 positive and 2 patients were IDH 2 positive Out of 21 grade IV patients, 5 patients were IDH 1 positive and 4 patients were IDH 2 positive. 2 patients had combined IDH 1 & 2 positivity.





**Conclusions:** The 2021 WHO CNS classification has put the highest emphasis on molecular markers than ever before. Biomarkers now play a pivot role in improving diagnostic accuracy, predicting treatment responses and to determine prognosis.

## Oncology

Oral presentation

Life-style and metabolic factors and risk for glioma: a population-based prospective study (The Cohort of Norway - CONOR)

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**Objectives:** Our aim was to perform a comprehensive analysis of life-style factors and measured metabolic factors (e.g. body mass, blood lipids, blood pressure, or glucose intolerance) in relation to risk for glioma.

**Background:** Modifiable risk factors for glioma, the most common malignant brain tumour, are largely unknown. Life-style factors or metabolic dysfunction are significant risk factors for several other cancers.

**Methods:** The Cohort of Norway (CONOR) is a prospective population-based health survey including data from anthropometric measures, blood tests and health questionnaires. CONOR was linked to the National Cancer Registry to identify glioma occurrence during follow-up. Follow-up time was calculated as person-years from time of baseline examination until date of glioma diagnosis, any other cancer diagnosis, death, or end of follow-up. Cox proportional hazard regression, was performed to calculate hazard ratios (HR) with 95% confidence intervals (CI).

**Results:** The study cohort consisted of 160 938 adult women and men at baseline examination. Median follow-up time was 19.4 years (IQR 16.3-22.2). During 2.8 million years of follow-up, 319 intracranial gliomas were diagnosed. The life-style factors physical activity, alcohol consumption, occupation or marital status were not associated with glioma risk. Increased glioma risk was observed in participants with 10-15 years of education compared to <10 years (HR 1.32; 95% CI 1.03-1.70). Allergies were not protective for glioma risk (HR 0.99; 95% CI 0.74-1.31). Glioma risk in participants with diabetes mellitus (HR 0.74; 95% CI 0.39-1.40) or hypertension (HR 1.01; 95% CI 0.79-1.29) was not increased. The blood lipids total cholesterol, triglycerides, HDL or LDL in quartiles were not associated with glioma risk. Metabolic syndrome in men (HR 0.83; 95% CI 0.53-1.29) or women (HR 0.62; 95% CI 0.31-1.22) was no risk factor for glioma.

**Conclusions:** Our study did not identify any life-style factors or metabolic syndrome as risk factors for glioma development.

## Hydrocephalus

Oral presentation

Evaluating the incidence and risk factors for ventriculoperitoneal shunt sepsis at Dr George Mukhari Academic Hospital in Pretoria

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**Objectives:** To establish our local incidence, and evaluate several known risk factors, for ventriculoperitoneal shunt sepsis in all consecutive patients who had a ventriculoperitoneal shunt inserted during a defined study period and completed 3 months of follow-up.

**Background:** Patients with increased intracranial pressure due to hydrocephalus are a common referral to the Department of Neurosurgery at our institution.

**Methods:** A descriptive cross-sectional study was performed considering all consecutive ventriculoperitoneal shunt procedures performed between the 01 January 2014 - 31 December 2018.

**Results:** Overall 335 ventriculoperitoneal shunts were inserted, 190 (57%) were inserted in children and 145 (43%) were inserted in adults. With regards the cause of hydrocephalus in 90/335 (26.9%) subjects this was congenital, in 45/335 (13%) subjects this was a primary intra-axial CNS tumour, in 40/335 (12%) subjects this was intraventricular haemorrhage, and in 38/335 (11%) subjects this was in the setting of a myelomeningocele. Considering the ventriculoperitoneal shunt infection rate 28/335 (8.4%) subjects developed this complication within 3 months of the procedure. In evaluating the significance of the known risk factors for ventriculoperitoneal shunt sepsis, our study demonstrated that having a ventriculoperitoneal shunt insertion performed in the emergency theatre ( $p=0.002$ ), having a ventriculoperitoneal shunt inserted at night ( $p=0.01$ ), having a history of ventriculoperitoneal shunt sepsis ( $p=0.0002$ ), being clinically immunosuppressed at the time of the ventriculoperitoneal shunt insertion procedure ( $p=0.03$ ), having an external ventricular drain in situ at the time of the ventriculoperitoneal shunt insertion procedure ( $p=0.003$ ), and having a post-operative cerebrospinal fluid leak ( $p=0.04$ ), demonstrated significance in predicting that ventriculoperitoneal shunt sepsis would occur.

**Conclusions:** Our study confirmed that our institutional ventriculoperitoneal shunt sepsis rate is 8.4% and furthermore confirmed the significance of several of the known risk factors as taken from the literature.

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## Spine

ePoster presentation

Acute low back pain in young female professional athletes

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**Objectives:** Aim of this study was to evaluate cases with acute low back pain in young female professional athletes.

**Background:** In 10 young, professional female patients (range of age 22-42, mean age 27) an evaluation of acute low back pain was performed.

**Methods:** We used

1. Clinical Examination,
2. Radiological Evaluation, ct and mri images,
3. Combination of pharmacological treatment with combination of diclofenac sodium and piroxicam.

**Results:** The results were very satisfied in 8 cases (80%) with pain relief and return to the daily activities (work, walk, sports activity). Only in 2 cases (20%) we report pain and arm weakness.

**Conclusions:** We need more patients but seems that the combination of clinical and radiological exams plus the appropriate treatment has good final outcome.

## Trauma

ePoster presentation

### Institutional guideline for the management of severe traumatic brain injury patients

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**Objectives:** Traumatic brain injury (TBI) is a major cause of mortality and morbidity worldwide, with more than 13 million people estimated to live with disabilities related to TBI in Europe and the USA. In low-income and middle-income countries (LMICs), the rising burden of TBI from the increase in a road traffic accident (RTA) incidence predominantly affects young individuals. For optimum care, patients should be moved along a chain of trauma care, from prehospital to post-acute care, following guidelines and protocols made on a global level or the level of single institution.

**Background:** The Clinical Center of Vojvodina is the reference institution for the treatment of severe traumatic brain injury (sTBI) patients coming from the majority of the territory of Vojvodina Autonomous Province. The Emergency Department was opened in 2010 and furnished with advanced equipment. Chain of trauma care is provided by neurosurgeons, anesthesiologists, and radiologists on a path from resuscitation room, multi-slice computerized tomography (MSCT) scan to the operating room (OR) and the intensive care unit (ICU).

**Methods:** During the year of 2022 total number of patients treated in the Emergency center was 63.250. Out of this number, there were about 800 neurosurgical patients with 175 sTBI patients.

**Results:** Owing to results in the management of traumatic brain injuries, presented at several neurotrauma meetings in Europe, the Clinical Center of Vojvodina became a part of the CENTER-TBI study, the largest European research project in TBI.

**Conclusions:** Despite the latest improvements, the recommendations are limited in many areas, reflecting persisting gaps in the evidence base for severe traumatic brain injury (TBI) management. Here we present a comprehensive protocol for sTBI patients in the Clinical Center of Vojvodina that relies on evidence-based medicine and our clinical experience.

## Skull Base

ePoster presentation

Long-term hormonal and imaging outcomes of adjunctive gamma knife radiosurgery in non-functioning pituitary adenomas: a single center experience

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**Objectives:** The objective of the study was to assess long-term hormonal and imaging outcomes after adjunctive Gamma Knife Radiosurgery (GKRS) in patients with non-functioning pituitary adenomas (NFPA).

**Background:** GKRS is an established modality for treatment of residual or recurrent NFPAs, and less commonly as a primary modality. There is relatively modest data on the long-term outcomes of GKRS in NFPAs.

**Methods:** A retrospective review of records of 109 patients with NFPA, from 1996 to 2020, who received adjunctive GKRS, was performed. Patients who had received GKRS as the primary modality of treatment for NFPA were not included.

**Results:** Sixty-three (57.8%) patients were available for follow up at our institute. The median follow-up period was 47 months (range, 6–260). At a median time of 38 months (range, 8–97), 25 (39.7%) patients developed  $\geq 1$  new pituitary hormone deficiency. Median time to cortisol deficiency was 38 months (range, 8–55), thyroid hormone deficiency was 45.5 months (range, 12–97) and gonadotropin deficiency was 45 months (range, 21–75). The actuarial risk of developing a new pituitary hormone deficit at 1, 3, 5, 7, and 10 years was 2.5%, 11%, 26.3%, 28% and 29.7%, respectively. Adenoma size decreased in 36 (57.1%) patients, remained unchanged in 19 (30.2%) patients, and increased in 8 (12.7%) patients. Overall tumor control rate was 87.3%. Endocrinopathy-Free Survival was 47.1%, and tumor Progression-Free Survival was 93.3%, at 5 years. Five (4.6%) patients required additional treatment after GKRS. One (1.6%) patient each had worsening of headache, optic atrophy and cerebellar infarct after GKRS therapy.

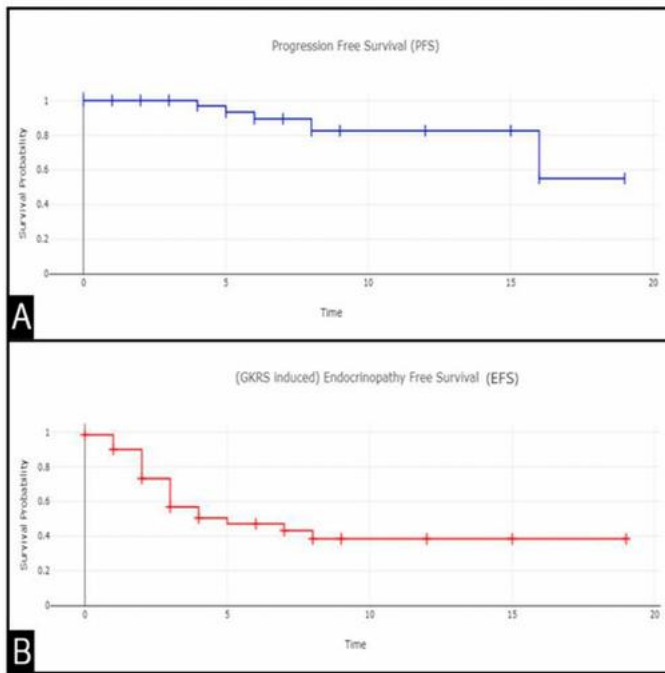


Fig. 2 Kaplan-Meier survival analysis in the follow-up cohort. **A** Kaplan-Meier plots estimating the progression free survival (PFS) in the patients of NFPA who underwent adjunctive GKRS. The 5-year PFS was estimated to be 93.3%. **B** Kaplan-Meier curves estimating the (GKRS induced) endocrinopathy free survival (EFS). The 5-year (GKRS induced) EFS was estimated to be 47.1%

**Conclusions:** GKRS offers a safe adjunctive treatment modality, with satisfactory long-term preservation of hormone functions and a high rate of tumor control, in patients with NFPA.

## Spine

Oral presentation

Epigenomics of miRNAs in Intervertebral Disc Degeneration: a key to the future development of genetic-based therapies; systematic review of literature

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**Objectives:** To summarize recent advances in the pathogenesis of Intervertebral disc degeneration (IDD) with regard to the miRNA expression profiles and investigate the possible therapeutic approaches to the disease utilizing the advanced genetic techniques in IDD.

**Background:** Low back pain (LBP) remains a public health problem being associated with high social and economic burden. The IDD is affected by genetic and environmental factors. Long non-coding RNAs exclusively the miRNAs regulate many genes that affects the acceleration or deceleration of the IDD. Up to now, many miRNAs have been identified to be upregulated or downregulated in IDD.

**Methods:** This is a systematic review article including all the published articles in English literature from January 1976 to April 2023 in main scientific databases including MedLine, Scopus, Google scholar and Thomson Reuters. We used the Mesh words "intervertebral disc degeneration", "epigenomics", "gene-therapy", "miRNA", "non-coding RNA" and etc. The articles were read and the data were extracted and analyzed.

**Results:** Accelerating or decelerating different mechanisms of IDD through miRNA vectors is currently underway. The NP cells are removed from the IVD and are harvested in vitro. The specific miRNA that plays a role in one of the pathophysiological processes of the IDD is selected and detected in the harvested NP cells. Afterward, the selected miRNA is synthesized in vitro and the cells are transfected so that the expression profile of the so-called miRNA is corrected to regulate the signaling pathway of the IVD to reverse the process of IDD. Then the manipulated NP cells are injected into the degenerated IVD as a treatment.



**Table 1** The expression profile, target signaling pathway and the mechanism of the various experimentally discovered miRNAs in intervertebral disc degeneration.

Mechanism	MiRNA	Expression	Signaling pathway		
<i>NP cell apoptosis</i> Increase	MiR-27a	↑	PI3K		
	MiR-494	↑	SOX9, JunD		
	MiR-30d	↑	SOX9		
	MiR-222-3p	↑	CDKN1B		
	MiR-15a	↑	MAP3K9		
	MiR-200c	↑	XIAP		
	MiR-328-5p	↑	ERBB2		
	MicroRNA-199a	↑	Wnt/ $\beta$ -Catenin Pathway		
	MiR-143	↑	Bcl-2		
	MiR-532	↑	Bcl-9		
	MiR-221	↑	ER $\alpha$		
	MiR-138-5p	↑	SIRT1		
	Decreased	MiR-155	↓	FADD, caspase-3	
		MiR-21	↓	PTEN	
		MiR-499a-5p	↓	SOX4	
		MiR-486-5p	↓	FOXO1	
		MiR-125a	↓	TP53INP1	
		MiR-145	↓	ADAM17	
		MiR-573	↓	Bax	
		MiR-17-3p	↓	MMP2	
<i>NP Cell Proliferation</i> Increased	MiR-21	↑	PTEN, PDCD4		
	MiR-10b	↑	HOXD10		
	MiR-96	↑	ARID2		
	MiR-184	↑	GAS1		
	MiR-2355-5p	↑	ERFF11		
	Decreased	MiR-17-3p	↓	MMP2	
		MiR-222-3p	↑	CDKN1B	
		MiR-15a	↑	MAP3K9	
		MiR-125b-1-3p	↑	TSHZ3	
	<i>ECM degradation</i> Increased	MiR-21	↑	PTEN	
MiR-494		↑	SOX9		
MiR-30d		↑	SOX9		
MiR-222-3p		↑	CDKN1B		
MiR-200c		↑	XIAP		
MiR-34a		↑	GDF5		
MiR-221		↑	FOXO3, TRPS1		
MicroRNA-199a		↑	SESN2		
MiR-665		↑	GDF5		
MiR-7		↑	GDF5		
MiR-132		↑	GDF5		
MiR-15b		↑	SMAD3		
MiR-377		↑	ADAMTS5		
MiR-100		↑	FGFR3		
MiR-210		↑	ATG7		
MiR-194		↑	CHSY1/2/3		
MiR-515		↑	CHSY1/2/3		
Decreased		MiR-3150a-3p	↑	ACAN	
		MiR-146a	Not known	TRAF6	
		MiR-155	↓	ERK1/2, TCF7L2, MMP-16	
		MiR-499a-5p	↓	SOX4	
		MiR-486-5p	↓	FOXO1	
		MiR-145	↓	ADAM17	
		MiR-17-3p	↓	MMP2	
		MiR-93	↓	MMP3	
		MiR-133a	↓	MMP9	
		MiR-27b	↓	MMP13	
		MiR-127-5p	↓	MMP13	
		MiR-193a-3p	↓	MMP14	
		MiR-98	↓	IL-6	
		<i>Inflammation</i> Increased	MiR-221	↑	BMP-Smad pathway
			MiR-2355-5p	↑	ERFF11
MiR-640			↑	LRP1, $\beta$ -catenin, EP300	
Decreased	MiR-140-5p		↓	TLR4	
	MiR-146a		Not known	TRAF6	

ECM: extracellular matrix; NP: nucleus pulposus; ↑: upregulation; ↓: downregulation

**Conclusions:** Our knowledge of the IDD pathogenesis and mechanisms has evolved during the past decade. Based on these mechanisms, imminent windows of developing effective regenerative therapies have grown and further developed.

## Skull Base

Oral presentation

A new area of neurosurgery: robotic neurosurgery first clinical series

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**Objectives:** In this presentation, we aim to share our experiences in our practical trainings of robotic surgery systems in neurosurgery and we added our clinical experiences we gained from our 8 patient clinical series, which is the first robotic neurosurgical case series in the literature.

**Background:** Although there are many new technological developments in today's neurosurgery practice, robotic surgery systems that are frequently used in other surgical branches are not widely used in neurosurgery.

**Methods:** Within the scope of robotic surgery preparation, Da Vinci Xi Surgical system training simulations were used and improvements were taken notes. After simulation trainings, neurosurgical techniques were applied on cadavers and calf brains with a surgical robots. These studies were repeated at regular intervals in line with the stated targets. After that, we operated 8 patients by using a robotic system. The clinical features and pathological data were evaluated as well as the surgical technique applied.

**Results:** 8 patients were operated in our clinic between 2018-2022 years by using the robotic surgery system. The most common pathology was clivus chordoma (4 out of 8). Also, 2 odontoid metastasis, 1 odontoid aneurysmal bone cyst and 1 arachnoid cyst were included. No additional neurologic deficit detected after surgeries. Both demographic and clinicopathological datas as well as the surgical outcomes are summarized in Table 1.

**Conclusions:** While robotic surgery systems are frequently used in other surgical branches, they are not yet frequently used in neurosurgery practice. Considering the 540-degree mobility of robotic arms and the possibility of vibration-free surgery, it is noteworthy that it may have advantages where the surgical corridor is narrow and deep, especially in odontoid and clivus pathologies. However, we think that before using robotic systems in routine surgical practice, proper trainings at regular intervals should be programmed to develop and maintain "robotic skills".

## Neurovascular Surgery

Oral presentation

In vivo human evidence for impaired glymphatic function after subarachnoid hemorrhage

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**Objectives:** The present study was undertaken to examine glymphatic function after subarachnoid hemorrhage (SAH) in patients.

**Background:** The dual discoveries of the glymphatic system and meningeal lymphatic system created a paradigm shift in our concepts about cerebrospinal fluid (CSF) circulation. Experimental studies in animals suggest altered functions of these CSF pathways after SAH, but in vivo evidence from human studies is lacking.

**Methods:** To assess glymphatic function, we utilized intrathecal contrast enhanced MRI (gMRI) with an MRI contrast agent (gadobutrol, 0,5 mmol) utilized as CSF tracer. Before and after intrathecal tracer injection, multiphase and standardized T1 MRI acquisitions were performed over 48 hours. For post-processing, we performed segmentation of brain parenchyma, CSF in subarachnoid spaces, and ventricular CSF spaces, using FreeSurfer software. Changes in tracer enrichment within the different compartments were quantified over time as percentage in the normalized T1 signal. As a proxy of glymphatic function, we used alterations over time for tracer enrichment in brain parenchyma.

**Results:** The study included 27 patients who had suffered a subarachnoid bleed either < 3 months, 3-6 months, 6-12 months or >12 months before the study, and also a reference cohort with no prior cerebral bleed. Depending on time after bleed, the SAH extensively affected CSF tracer enrichment in parenchyma (glymphatic transport), as well as in CSF spaces of subarachnoid spaces.

**Conclusions:** The present results provide in vivo evidence that SAH extensively affects glymphatic function in humans.

## Spine

Oral presentation

Can arcuate foramen variation of the atlas be a risk factor for posterior circulation ischemic stroke in adults?

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**Objectives:** We aimed to investigate the relationship between arcuate foramen (AF) and posterior circulation ischemic stroke (PCIS) in adults.

**Background:** The prevalence of AF, which is one of the variations of the first cervical vertebra (atlas), is between 1.14% and 68%, and its incidence varies according to populations and examination methods. Computed tomography (CT) is the gold standard in its diagnosis. AF has incomplete (iAF) and complete (cAF) types, and cAF gives more clinical findings than iAF and, by compressing the vertebral artery passing through the foramen and leading to vertebrobasilar (VB) insufficiency. Again, it is known that AF also causes PCIS in childhood and adolescents (9,10), whereas its relationship with PCIS in adults is still unknown.

**Methods:** The sagittal sections of cervical CT scans and the late diffusion sequences of magnetic resonance imaging of 169 patients aged between 15 and 65 years treated for posterior circulation ischemia were evaluated retrospectively. NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA) program was used for statistical analysis.

**Results:** cAF was detected in 26% of the cases, and in 47% of the cases, iAF was detected (Table 1). According to the cAF results, a not statistically significant difference was found between the strokes in the irrigation areas of the VB system ( $p > 0.05$ ) (Table 2).

	Absent	Right	Left	Bilateral
	n (%)	n (%)	n (%)	n (%)
<b>Cerebellar</b>	112 (66,3)	17 (10,1)	34 (20,1)	6 (3,6)
<b>Pons</b>	122 (72,2)	24 (14,2)	17 (10,1)	6 (3,6)
<b>Bulbus</b>	158 (93,5)	3 (1,8)	8 (4,7)	0 (0,0)
<b>Thalamic</b>	153 (90,5)	5 (3,0)	11 (6,5)	0 (0,0)
<b>Mesencephalon</b>	155 (91,7)	4 (2,4)	9 (5,3)	1 (0,6)
<b>Occipital lobe</b>	163 (96,4)	2 (1,2)	2 (1,2)	2 (1,2)
<b>PCA</b>	136 (80,5)	8 (4,7)	21 (12,4)	4 (2,4)
<b>cAF</b>	125 (74,0)	15 (8,9)	13 (7,7)	16 (9,5)
<b>iAF</b>	90 (53,3)	16 (9,5)	18 (10,7)	45 (26,6)

cAF: complete arcuate foramen, iAF: incomplete arcuate foramen, PCA: Posterior cerebral artery

**Table 1:** Distribution of magnetic resonance localization of ischemia and computed tomography localizations of the arcuate foramen

Ischemia MR Localizations	cAF				P
	Absent n (%)	Right n (%)	Left n (%)	Bilateral n (%)	
<b>Cerebellar</b>	Absent 82 (65,6) 12 (80,0) 6 (46,2) 12 (75,0)	Right 13 (10,4) 2 (13,3) 0 (0,0) 2 (12,5)	Left 25 (20,0) 1 (6,7) 7 (53,8) 1 (6,3)	Bilateral 5 (4,0) 0 (0,0) 0 (0,0) 1 (6,3)	<b>*0,145</b>
<b>Pons</b>	Absent 89 (71,2) 13 (86,7) 9 (69,2) 11 (68,8)	Right 19 (15,2) 2 (13,3) 2 (15,4) 1 (6,3)	Left 11 (8,8) 0 (0,0) 2 (15,4) 4 (25,0)	Bilateral 6 (4,8) 0 (0,0) 0 (0,0) 0 (0,0)	<b>*0,590</b>
<b>Bulbus</b>	Absent 117 (93,6) 15 (100,0) 12 (92,3) 14 (87,5)	Right 3 (2,4) 0 (0,0) 0 (0,0) 0 (0,0)	Left 5 (4,0) 0 (0,0) 1 (7,7) 2 (12,5)	Bilateral 0 (0,0) 0 (0,0) 0 (0,0) 0 (0,0)	<b>*0,549</b>
<b>Thalamic</b>	Absent 115 (92,8) 11 (71,3) 12 (92,3) 15 (93,8)	Right 3 (2,4) 0 (0,0) 0 (0,0) 0 (0,0)	Left 7 (5,6) 2 (13,3) 0 (0,0) 1 (6,3)	Bilateral 0 (0,0) 0 (0,0) 1 (7,7) 1 (6,3)	<b>*0,221</b>
<b>Mesencephalon</b>	Absent 115 (92,8) 13 (86,7) 12 (92,3) 15 (93,8)	Right 4 (3,2) 0 (0,0) 0 (0,0) 0 (0,0)	Left 6 (4,8) 2 (13,3) 1 (7,7) 0 (0,0)	Bilateral 0 (0,0) 0 (0,0) 0 (0,0) 1 (6,3)	<b>*0,500</b>
<b>Occipital</b>	Absent 121 (96,8) 15 (100,0) 12 (92,3) 15 (93,8)	Right 1 (0,8) 0 (0,0) 0 (0,0) 1 (6,3)	Left 1 (0,8) 0 (0,0) 1 (6,3) 0 (0,0)	Bilateral 2 (1,6) 0 (0,0) 0 (0,0) 0 (0,0)	<b>*0,363</b>
<b>PCA</b>	Absent 101 (80,8) 10 (66,7) 13 (100,0) 12 (75,0)	Right 7 (5,6) 1 (6,7) 0 (0,0) 0 (0,0)	Left 15 (12,0) 3 (20,0) 0 (0,0) 3 (18,8)	Bilateral 2 (1,6) 1 (6,7) 0 (0,0) 1 (6,3)	<b>*0,335</b>

cAF: complete arcuate foramen, iAF: incomplete arcuate foramen, MR: magnetic resonance, PCA: Posterior cerebral artery

**Table 2:** Comparison of magnetic resonance localization of vertebrobasilar ischemia according to complete arcuate foramen findings

**Conclusions:** Our findings suggest that cAF may not be one of the main risk factors for PCIS in adults under 65. However, 26% of cases had cAF. Therefore, this variation should be considered in diagnosing posterior circulation transient ischemic attacks (TIAs) of unexplained etiology. And, it should investigate whether the dominant VA is compressed by cAF. If the compression is detected, AF resection on the compression side may be protective against TIAs.

## Oncology

Oral presentation

### Fatigue, anxiety and cognitive function in neurosurgical patients: a prospective multi-centre longitudinal study

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**Objectives:** The authors aimed to determine postoperative fatigue after neurological surgery as well as its impact on anxiety, depression, and cognitive impairment.

**Background:** Postoperative fatigue following neurosurgery is not well understood. Moreover, mood disturbances and cognitive dysfunction after surgery can have significant impact on patients' recovery. Their association with postoperative fatigue remain unclear. Previous studies were largely retrospective, used small sample sizes and lacked longitudinal data.

**Methods:** A prospective multicentre study was conducted on patients undergoing elective or semi-elective cranial or spinal surgery at two tertiary neurosurgical centres and two private hospitals. Questionnaires, including the Fatigue Severity Scale (FSS), Cognitive Failures Questionnaire (CFQ) and the Hospital Anxiety and Depression Scale (HADS) were collected pre-operatively, at 1 and 6 weeks, and at 3 and 6 months post-operatively.

**Results:** Between 2017 and 2023, 181 patients (90 cranial, 91 spinal) were enrolled. Cranial patients experienced postoperative fatigue at all timepoints (FSS threshold  $\geq 4$ ), worse at week 1 ( $p=0.01$ ), and returning to baseline from week 6. Spinal patients also experienced postoperative fatigue at week 1 but improved rapidly by week 6 ( $p<0.01$ ). CFQ scores increased by 4.0 and 2.7 points at week 1 and 6 ( $p<0.05$ ), respectively, in both groups. FSS and CFQ scores were directly correlated at all timepoints, adjusted for surgery type and HADS anxiety score ( $p<0.05$ ). Similarly, patients with higher postoperative fatigue experienced greater anxiety (difference ranged 0.39-0.82,  $p<0.05$ ) and depression (difference ranged 0.85-1.21,  $p<0.01$ ).

**Conclusions:** Cranial patients had more postoperative fatigue than spinal patients in the weeks after surgery before returning to baseline. Postoperative fatigue worsens anxiety, depression, and cognition.

## Global Neurosurgery

Oral presentation

The impact of colonialism on surgical training structures in Africa: surveying current and past trainees

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**Objectives:** This study explored the current pathways available for medical specialists pursuing surgical training in all five African geographical regions, along with reporting on the barriers to subspecialty training and identifying potential strategies to mitigate the “brain drain” of professionals.

**Background:** Since the first African country attained independence from colonial rule, surgical training has evolved through three models. The first is a colonial-local master student model, the second is a purely local training model, and the third is a collegiate inter-country model. Unfortunately, the surgical workforce is still grossly under-represented within Africa, and the surgical burden of disease is an unmet need. The situation is further worsened by “brain drain”, where we lose surgical specialists to HICs.

**Methods:** A cross-sectional survey which was administered over 3 months from December 2022 – February 2023 explored the experiences and perspectives of surgical training structures on the continent by surgical trainees and graduates. The survey population included surgeons and trainees from the following regional training centres, College of East, Central and Southern Africa (COSECSA), College of Medicine South Africa (CMSA), Western African College of Surgeons (WACS), along with other national training programs.

**Results:** A total of 239 complete unique responses (20% response rate) were recorded. There was a strong association between the region of residence and chosen college/structure of training ( $p < 0.001$ ). The college/structure of residency strongly correlated with the desire to complete subspecialty training ( $p = 0.008$ ). The College/structure of residency also had a strong relationship with the successful completion of subspecialty training ( $p < 0.001$ ).

**Conclusions:** These findings support the concept that the segmentation of surgical training structures in Africa may directly result from prior colonization. This has affected the distribution of trainees and specialists across the continent and the globe. These inequities must be addressed, acknowledged, and rectified to ensure that African patients receive timely and appropriate surgical care.



## Spine

Oral presentation

### Thoracic myelopathy secondary to ossification of ligamentum flavum: therapeutic and prognostic study of 9 cases

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**Objectives:** To study the therapeutic and evolutionary characteristics of thoracic myelopathy secondary to ossification of ligamentum flavum.

**Background:** Thoracic myelopathy due to ossification of ligamentum flavum is a rare condition, originally described in Asia. It is a pathology with an insidious course, presenting a picture of slow spinal cord compression, sometimes with posterior cord involvement in the foreground. Surgery remains the gold standard in the management of this condition. Surgery has its limitations, however, as the functional prognosis is often compromised, with a non-negligible risk of postoperative worsening.

**Methods:** We carried out a retrospective study of 9 patients operated on for thoracic myelopathy secondary to ossification of ligamentum flavum. These patients were collected at our neurosurgery department, over a period running from January 2011 and January 2023.

**Results:** The mean age of our patients was 49.2 years. A slight female predominance was noted. The mean diagnostic delay was 17.6 months. Symptomatology was dominated by motor disorders, present in all patients in our series. Some had sphincter disorders and others had sensory disorders. Radiological examinations were used to diagnose the myelopathy and determine its extent and impact. All patients underwent posterior laminectomy. The most frequent complication was CSF leakage, present in three of the patients in our series. Post-treatment follow-up showed an improvement in JOA score in 2 patients, stability in 4, and worsening in 2.

**Conclusions:** Thoracic myelopathy secondary to ossification of ligamentum flavum remains an uncommon pathology. Its management remains delicate, despite technical advances. It is a surgery fraught with significant morbidity in relation to the risks associated with surgery, with a risk of neurological aggravation due to the manipulation of a spinal cord whose vascularization is precarious and weakened by prolonged spinal cord compression.



## Trauma

ePoster presentation

### Management of post concussion syndrome in elite female athletes

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**Objectives:** Post concussion syndrome is a situation that needs appropriate approach and management, especially in elite athletes.

**Background:** Aim of this study was to evaluate post concussion syndrome disorders in elite female athletes.

**Methods:** 10 women – 100% with post concussion syndrome disorders

Evaluation of 10 elite female athletes was performed:

- 1 basketball player (10%)
- 1 football (soccer) players (10%)
- 1 volleyball player (10%)
- 3 gymnastics athletes (30%)
- 1 swimmer (10%)
- 1 tennis athlete (10%)
- 2 long distance runner (20%)

**Results:** The most common disturbances were:

- headaches and dizziness in 3 patients-30%,
- fatigue in 3-30%,
- anxiety in 2-20%,
- insomnia in 1,10%,
- loss of memory in 1, 10%.

We suggest in all of them (10,100%), cognitive therapy and appropriate medication, under neurological and psychiatric surveillance. 8 of them- 80%-returned with safe results in the physical activity after 3 weeks period.

**Conclusions:** It seems that cognitive-behavioural therapy and medication could be helpful in these situations. Post concussion syndrome remains a post traumatic condition that needs accurate evaluation and approach.

## Trauma

Oral presentation

### Non-invasive intracranial pressure assessment by optic nerve sheath diameter: automated measurements as an alternative to clinician performed measurements

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**Objectives:** In this study, we evaluate a novel method of automated measurements of the optic nerve sheath diameter (ONSD) and its agreement with manual measurements. Furthermore, we compare correlation to invasively measured intracranial pressure (ICP) and ability to distinguish dichotomized ICP in automated and manual measurements.

**Background:** ONSD has shown promise as a non-invasive parameter for estimating ICP. Manual measurements of ONSD do however remain operator dependent, with intra- and inter-operator variability. Automated measurements may alleviate some of these challenges.

**Methods:** From adult traumatic brain injury (TBI) patients with invasive ICP monitoring, bedside manual ONSD measurements and ultrasound videos of the optic nerve sheath complex were simultaneously acquired. Automatic ONSD measurements were obtained by processing of the ultrasound videos by the novel software. Agreement between manual and automated measurements, as well as their correlation to invasive ICP, was evaluated. Ability to distinguish dichotomized ICP for manual and automatic measurements of ONSD was also compared, both for ICP dichotomized at  $\geq 20$ mmHg and at the 50<sup>th</sup> percentile ( $\geq 14$ mmHg).

**Results:** A total of 43 ultrasound examinations were performed in 25 patients. The median pairwise difference between automatically and manually measured ONSD was 0.06mm (IQR -0.44mm-0.38mm;  $p=0.80$ ). Manually measured ONSD showed a positive correlation with ICP, while automatically measured ONSD showed a trend towards, but not a statistically significant correlation with ICP. When examining for ability to distinguish dichotomized ICP, manual and automatic measurements performed with similar accuracy both for an ICP cut-off at 20mmHg (manual: AUC 0.74, 95%CI 0.58-0.88; automatic: AUC 0.83, 95%CI 0.66-0.93) and for an ICP cut-off at 14mmHg (manual: AUC 0.70, 95%CI 0.52-0.85; automatic: AUC 0.68, 95%CI 0.48-0.83).

**Conclusions:** The novel automated method of measuring the ONSD on ultrasound videos using segmentation of the optic nerve sheath showed a reasonable agreement with manual measurements and performed equally well in distinguishing high and low ICP.

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## Spine

ePoster presentation

Meloxicam as a treatment of middle age male patients with chronic low back pain

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**Objectives:** Chronic back pain is defined as pain that continues for three months or even longer. Many times the causes of acute low back pain has not been initially well evaluated and treated. Is a condition that effects the quality of life and also the health related quality of life.

**Background:** Aim of this study was to evaluate the use of use of meloxicam in middle age male patients (50-60 years old) male patients, with chronic low back pain.

**Methods:** 10 male middle age patients were participated in this study. In all patients we perform clinical neurological exam and radiological exam with x-ray control, ct-images and mri images. None of the patients reported other internal medicine or cardiological problems. For 14 days (2 weeks) they receive 75 mg meloxicam, two times a day. Range of age 50-60 years and mean age 55. We used specific performance pain tests (oswestry scale and prolo scale) in order to evaluate our results. Follow up was between 6 months and 12 months with mean period of 9 months.

**Results:** 9 of them (90%) reported optimal results and good reaction to the treatment. 1 of them (10%) reported moderate results and mild reaction to the treatment.

**Conclusions:** We need more patients but this therapeutic path seems to be an optimal and safe treatment, especially for middle age patients. Chronic low back pain remains a situation with necessity of adequate evaluation and management, in order to ameliorate the overall health.

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## Spine

ePoster presentation

Osteoporotic spine fractures in elderly patients with amateur athletic activity. Radiological evaluation

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**Objectives:** Aim of this work is to present the radiological evaluation of spine fractures in patients with amateur athletic activity.

**Background:** 20 elderly consecutive patients (10 female and 10 male, 50% and 50%, mean age 70 ,range of age between 65 and 75 ) were evaluated for spine osteoporotic fractures.

**Methods:** We used ct,mri and xray images.

**Results:** In all of them (20,100%) we performed clinical and radiological evaluation.

16 (80%) of them present osteoporotic fractures with the necessity of conservative treatment and 4 (20%) of them present osteoporotic fractures with the necessity of surgical intervention.

**Conclusions:** Radiological evaluation remains essential in order to plan the optimal treatment.

## Spine

Oral presentation

Is age a factor that influences the clinical outcome of MIS-TLIF? A single center study on 103 consecutive cases

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**Objectives:** The aim of this study was to investigate if older age is a significant factor in the clinical outcome of single- or double-level Minimal Invasive Surgery - Transforaminal Lumbar Interbody Fusion (MIS-TLIF).

**Background:** As life expectancy rises, more elderly people undergo spinal fusion surgery to treat lumbar degenerative diseases. Older age is associated with concerns about comorbidities, hospitalization resilience, and mobility issues, which may interfere with patients' perceptions of clinical outcomes. The MIS-TLIF technique, which minimizes soft tissue manipulation, is a promising fusion technique for frailer patients.

**Methods:** A cross-sectional study was conducted on the clinical outcomes of 103 consecutive single- or double-level MIS-TLIF patients with a minimum of 2 years of follow-up. Data was compared between younger (<65 y.o.) and older (≥65 y.o.) patients.

**Results:** We observed no significant differences between baseline characteristics of the two groups apart from the frequency of disk space treated, with a relative predominance of L3-L4 space treated in the elderly (10% younger vs 28% older patients,  $p=0.01$ ) and L5-S1 space in younger patients (36% younger vs 5% older patients,  $p=0.006$ ). There was no significant difference in complication rate, surgical satisfaction (76% younger vs 84% older patients,  $p=0.4$ ), EQ 5D-5L or Oswestry Disability Index (ODI) global or specific scores, with the exception of the EQ 5D-5L "mobility" score, where older patients fared worse ( $1.8 \pm 1.1$  younger vs  $2.3 \pm 1.4$  older patients;  $p=0.05$ ).

The minimal invasiveness of the surgical technique, age-related specific outcome expectations, and biomechanical issues are all potential factors influencing the lack of age-group differences in outcome scores.

**Conclusions:** The clinical outcome of single- or double-level MIS-TLIF is unaffected by advanced age. High levels of satisfaction can be reported when the appropriate minimally invasive technique is used in conjunction with careful patient selection and preoperative counseling.

## Oncology

ePoster presentation

Global, regional and national forecasting study on the prevalence of brain and other central nervous system tumors by 2040

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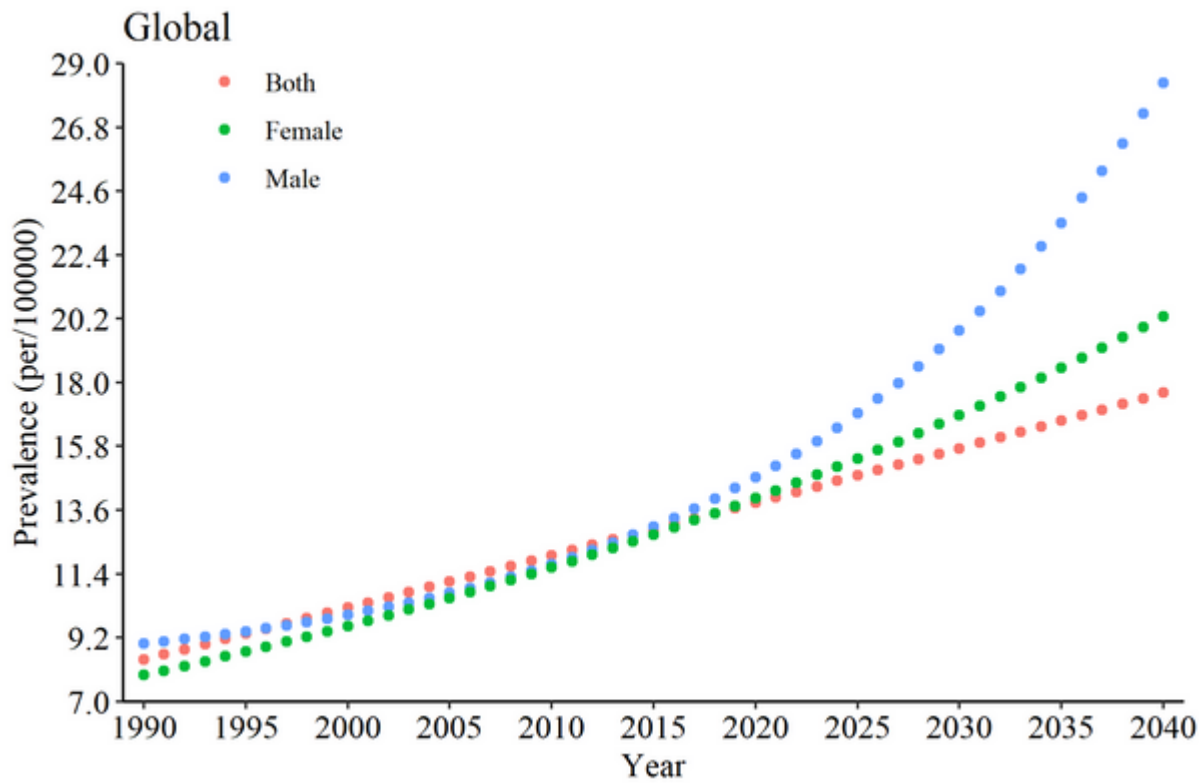
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**Objectives:** This study investigated the age-standardized prevalence rate (ASPR) of brain and other CNS cancer at global, regional, and national levels by 2040.

**Background:** Brain and other central nervous system (CNS) cancers are major public health issues with increasing trends in incidence and prevalence during the last decades. CNS cancers are accounted for the second most common cause of disability-adjusted life years.

**Methods:** We set up a robust statistical model for forecasting the ASPR. Therefore, we set an illness-death model (IDM) based on the reported information on the brain and other CNS cancer from 1990 to 2019 prepared by Institute for Health Metrics and Evaluation. Then, we used an inverse model to predict the ASPR by 2040.

**Results:** We showed that the global ASPR of brain and other CNS cancer is 17.64 patients per 100,000 for combined males and females, 28.33 patients per 100,000 for males, and 20.28 patients per 100,000 for females in 2040. Western Europe, High-income Asia Pacific, and High-income North America had the highest projected ASPR with the value of 55.12, 41.72, and 26.11 patients per 100,000, with the lowest projected ASPR of 2.24, 2.78, and 3.37 patients in 100,000 for Central Sub-Saharan Africa, Southern Sub-Saharan Africa, and Oceania. At the national level, Serbia, Thailand, Samoa, and Iran had the greatest projected ASPR in 2040, with a value of 602.43, 577.92, 294, and 211.32 patients per 100,000 people. Meanwhile, the lowest projected ASPR had observed in Vanuatu, Niger, and Tunisia, with the value of 0.02, 0.11, 0.25 patients per 100,000 individuals.



**Conclusions:** Our projection demonstrates that brain and other CNS cancer prevalence will be steadily increasing by 2040. High-income regions had the highest projected ASPR, while the highest projected increase is present in Caribbean, Eastern Sub-Saharan Africa, and Tropical Latin America regions.

## Trauma

Oral presentation

### Extracellular vesicle protein markers in traumatic brain injury

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**Objectives:** To employ a first-of-its-kind affordable technique to identify multiplexed extracellular vesicle (EV)-associated antigens in traumatic brain injury (TBI).

**Background:** EVs were implicated in recent research as valuable acute-phase biomarkers in several clinical conditions, ranging from cancer to myocardial infarction. Although much is known about soluble proteomic markers of TBI and their prognostic utility, there is scant research on EV or exosome-associated markers. These markers were found to be of additional clinical significance in other conditions involving disruption of the blood-brain barrier, such as stroke, and, in animal models of TBI, are effective acute-phase targets to limit secondary injury and haemorrhagic expansion.

**Methods:** We used historical samples from the ACIT study (ISRCTN12962642) taken up to two hours after trauma. Isolated TBI (Abbreviated Injury Severity [AIS] Craniospinal  $\geq 3$  and AIS  $<3$  in other segments) cases were matched with extracranial trauma controls using propensity score matching. Samples were analyzed using Nano Tracking Particle Analysis (NTA) and a locally developed high-throughput array uses a capture antibody with the antigen of interest and a cocktail of antibodies against EV canonical antigens as the detection antibodies.

**Results:** Groups were comparable after PSM. TBI patients had higher levels CD62P, CD62E, CD146, CD106, CD45, CD56, ICAA-1, CD24 ( $P < 0.01$ ), and CD142 CD4, NSE, and Alix ( $P < 0.001$ ) in spite of normal total protein values. Linear regression also showed they correlated to Injury severity scores (ISS), Craniospinal AIS and length of hospital stay. Other neuronal markers such as GFAP, S100b and NF-L showed no difference across groups. Hierarchical clustering analysis showed partial stratification of TBI patients from controls using EV data only. Principal component analysis accounted for 45.3% of the variance and showed significant overlap between the antigens tested.

**Conclusions:** EV antigens associated with immune activation and thrombogenesis are elevated when TBI is present and have clinical significance.



## Oncology

Oral presentation

### Surgical treatment of intradural extramedullary tumors

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**Objectives:** To analyze the results in a series of patients operated on due to intradural-extramedullary tumors (IDET) and assess factors that may determine the final long-term outcome.

**Background:** The majority of IDEMTs are benign lesions and include schwannomas, neurofibromas, meningiomas, and ependymomas. They can lead to spinal cord compression. Decompression surgery and total tumor resection are considered the gold standard of treatment.

**Methods:** We performed a retrospective study of a series of patients with IDEMToperated on in our Institution. Several preoperative demographics, clinical, imaging and surgical features, as well as histopathology, recurrence and adjuvancy were assessed. Final clinical outcome was categorized using the McCormick scale.

**Results:** A total of 203 patients with a mean follow-up of 30.50 months were included. Mean age was 50.51 years and 57.64% were female. The most frequent location was dorsal spine followed by the lumbar region and the most frequent histopathology was Schwannoma, followed by Meningioma. Pain was the most frequent initial symptom. Fifty-seven patients presented tumor-occupancy ratio of 80% or more and 76 patients showed signs of myelomalacia on MRI. Extradural extension was seen in 23 patients (11.33%) mostly in schwannomas/ neurofibromas. Total-resection was achieved in 84.24% of cases. Laminectomy was performed in 53.20% of the patients followed by hemilaminectomy in 45.32%. In 20 patients (9.85%) spinal instrumentation was required. In our analysis, functional outcome after surgery was associated with statistical significance with preoperative McCormick grade, tumor type, EOR and postoperative complications such as hematoma and sphincter involvement.

**Conclusions:** The management of these lesions depends on many factors. It is worthy of mention that clinical presentation, extent of resection, histopathology and postoperative complications have shown significant prognostic value for the final outcome. Early treatment with the intention of achieving gross-total resection when possible should be considered before the onset of significant symptoms.

## Neurovascular Surgery

ePoster presentation

### Seizure incidence of angiogram-negative subarachnoid hemorrhage: an updated meta-analysis

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**Objectives:** To provide updated information on seizure events and patterns in patients with angiogram-negative subarachnoid hemorrhage based on the initial hemorrhage patterns: perimesencephalic subarachnoid hemorrhage (PMH) vs non-PMH.

**Background:** The incidence of seizure has been reported in up to 27.5% of aneurysmal SAH patients and is thought to be associated with severity of the initial brain injury. Thick SAH, acute hydrocephalus, and rebleeding are risk factor for ictal or immediate seizures following SAH. However, to date, detailed information on seizure activity after ictus has not been well elucidated in patients with angiogram-negative SAH, although literature review regarding DCI and hydrocephalus has been continuously updated.

**Methods:** A review of online database literature from January 1990 to November 2017 was systematically performed. In case of heterogeneity <50%, a fixed effect model was used. Publication bias was determined using Begg funnel plot and the trim-and-fill method.

**Results:** A total of 9 studies with 645 patients were included for final analysis after excluding one study without any seizure within either cohort. PMH patients had lower seizure rates (odds ratio, 0.393; 95% CI, 0.158-0.978) compared with non-PMH patients. The funnel plot showed a relatively asymmetric pattern, suggesting possible publication bias. After correction of the forest plot, the adjusted odds ratio was 0.362 (95% CI, 0.148-0.886), indicating significant relationships between PMH and lower incidence of seizure.

**Conclusions:** PMH is associated with lower seizure risk than non-PMH. However, possible publication bias could be a concern to the interpretation. Additional meta-analyses based on individual patient data from prospective large-scale studies are necessary.

## Trauma

ePoster presentation

### MLC601/MLC901 use in Traumatic Brain Injury (TBI)

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**Objectives:** The ongoing NeuroAiD Safe Treatment (NeST) Registry (ClinicalTrials.gov Identifier NCT02536079) examined NeuroAiD safety and efficacy in a cohort of traumatic brain injury (TBI) subjects from Malaysia.

**Background:** MLC601/MLC901 (NeuroAiD) is a formulation of natural products shown to aid neurological recovery after injury, especially ischemic stroke. Its evidence still remains limited in TBI.

**Methods:** The NeST Registry prospectively collected data from patients who were given MLC601/MLC901. Data collected at baseline and visits (V) 1, 2, and 3, included demographics; medical conditions; clinical assessments of the Glasgow Coma Scale (GCS), modified Rankin Scale (mRS), and Short Orientation Memory Concentration Test (SOMCT); compliance; concomitant medications; and adverse events.

**Results:** This analysis included 23 subjects given MLC601/MLC901 for TBI, of whom 18 had data until V3. Median age was 36 years (range 15-64), with 17% (4) female. The median GCS at baseline was 11 (moderate TBI). The median time from injury to NeuroAiD administration was 20 days (range 7-40). All clinical assessments showed improvement over time. At baseline, only 30% (7) had GCS of 13-15, improving to 83% (15) by V3. For functional independence per mRS, none had mRS 0-1 at baseline, improving to 33% (6) by V3. For cognitive function per SOMCT score, 61% (14) had severe cognitive impairment at baseline, decreasing to only 22% (4) by V3. There were 2 subjects with deterioration of GCS score (only 1- and 2-point decrease) but their level of functional independence per mRS was preserved. No other adverse events were noted.

**Conclusions:** MLC601/MLC901 is demonstrated to be a safe adjunctive therapy for aiding recovery in TBI. Larger studies should further assess its safe use in enhancing TBI recovery.

## Functional

ePoster presentation

Trigeminal neuralgia, radio frequency lesion generation (Rflg) treatment, my experience of 72 procedures in Amritsar, India

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**Objectives:** This article highlights the treatment modality radio frequency lesion generation for trigeminal neuralgia, a very debilitating painful condition. My experience of 72 procedures will provide useful insight for this alternative modality which gives results comparative to MVD surgery.

**Background:** This paper presents my experience of Trigeminal Neuralgia (TN) cases treated by RFLG in a private hospital in Amritsar, India. I provide a personal account of patients undergoing 72 radiofrequency lesioning (RFLG) treatments for trigeminal neuralgia (TN) over a period of 8 years. It details my journey from the initial diagnosis of TN and the decision to undergo RFLG treatment in India.

**Methods:** This article describes the patient's clinical profile, including their history, presenting symptoms, and previous treatments for TN. Cases of secondary TN due to brain tumour were not included in the study. This article provides details of the methodology adopted by me on the RFLG treatment procedure, including pre-operative preparation, anaesthesia, and post-operative care. I would also discuss my follow-up protocol and the recurrence rate of TN following RFLG treatment.

**Results:** The RFLG treatment was successful in providing immediate pain relief in 80% of cases. One case had hemiparesis, which recovered significantly in 15 days. Why it happened and how to avoid such complication is a good educational material. The recurrence rate was 30% in 2 years of follow-up. The article also compares the efficacy, complications, and cost of RFLG treatment in comparison to other modalities, such as microvascular decompression (MVD) and gamma knife therapy.

**Conclusions:** In conclusion, I recommend that TN cases in which medical treatment is ineffective, fluoroscopic guided RFLG is the preferred choice. The low cost of the procedure and short hospital stay makes it preferred modality especially in developing countries.

## Global Neurosurgery

ePoster presentation

### MLC601/MLC901 use in Intracranial Hemorrhage (ICH)

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**Objectives:** The ongoing NeuroAiD Safe Treatment (NeST) (ClinicalTrials.gov Identifier NCT02536079) Registry examined NeuroAiD safety and efficacy in a cohort of subjects with Intracranial Hemorrhages from Malaysia.

**Background:** MLC601/MLC901 (NeuroAiD™), a combination of natural products, has been shown to be safe and to aid neurological recovery after brain injuries, particularly ischemic stroke. Few studies explored NeuroAiD use in primary intracerebral hemorrhage (ICH). The NeuroAiD Safe Treatment Registry (NeST) studies NeuroAiD use in the real-world setting.

**Methods:** The online NeST registry of subjects with ICH given NeuroAiD respectively collected clinical data at baseline and monthly visits (V) 1 to 3. Outcome measures included compliance, side effects, Glasgow Coma Scale (GCS), modified Rankin Scale (mRS), National Institutes of Health Stroke Scale (NIHSS), and Short Orientation-Memory-Concentration Test (SOMCT).

**Results:** Sixty-six subjects were included. NeuroAiD was well-tolerated with fair compliance over 3 months. Two non-serious side effects were reported. Mean scores significantly improved in all outcome scales. The proportion of subjects with favorable outcomes improved from baseline to V3: GCS 13-15, from 64% to 88% ( $p=0.007$ ); mRS 0-1, from 9% to 37% ( $p=0.004$ ); NIHSS 0-4, from 12% to 59% ( $p<0.0001$ ); and SOMCT score 0-8, from 44% to 68% ( $p=0.029$ ).

**Conclusions:** MLC601/MLC901 in the real-world setting was safe and showed potential for a sustained positive result on neurological recovery after ICH.

## Oncology

ePoster presentation

### Effects of E-spinning variables on PLGA based nanofibers for the delivery of sustain release anti-tumor drug

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**Objectives:** To fabricate and study effects of E-spinning variables on PLGA based nanofibers for the delivery of sustain release anti-tumor drug.

**Background:** Chemotherapeutic agents struggle to achieve therapeutic concentrations at the tumor site due to the protective environment of the central nervous system (CNS). Nanofibers could pave the way for the development of a 'smart' polymeric drug delivery system with great potential to facilitate the movement of drugs across the blood brain barrier. Polymers that hydrate or swell, such as PLGA, PLA, etc. are used to create a sustained release nanofiber that alleviates the initial burst release of trapped drug from the core shell, giving it better sustainability.

**Methods:** In this typical process, the polymeric fluid is extruded from the orifice of a needle when the electric field is sufficiently strong, Charges build up on the surface of the droplet, which overcomes the surface tension to induce the formation of a liquid jet, which subsequently accelerates towards a grounded collector. As the solvent is evaporating, this liquid jet is stretched many times its original length to produce continuous, ultrathin fibers of the polymer. There are several governing parameters that directly affect drug release kinetics, such as electric field power, feed rate, needle diameter, and needle and collector distance, which show a considerable effect on drug release kinetics. Other factors include solution parameters such as choice of solvent, polymeric concentration, viscosity, and conductivity of a solution, and environmental parameters such as relative humidity and temperature, which play an influential role in generating smooth and bead-free electrospun fibers.

**Results:**

Polymer Solution (%)	Distance (cm)	Voltage (kV)	Flow rate (ml/hr)	Observation	Image
7	10	9	0.2	No fabrication	
7	12	12	0.35	No fabrication	
7	14	16	0.5	No fabrication	
10	10	9	0.2	No fabrication due to less viscosity	
10	12	12	0.35	No fabrication due to less viscosity	
10	14	16	0.5	No fabrication due to less viscosity	
14	10	9	0.2	Sputtering and no fibers formed	
14	12	12	0.35	Sputtering and no fibers formed	
14	14	16	0.5	no fibers formed	

Polymer Solution (%)	Distance (cm)	Voltage (kV)	Flow rate (ml/hr)	Observation	Image
16	10	9	0.2	Desired size not obtained	
16	12	12	0.35	Desired size not obtained	
16	14	16	0.5	Desired size not obtained	
18	10	9	0.2	Not uniform	
18	12	12	0.35	Desired range 200-300nm and uniform	
18	14	16	0.5	Not uniform	
20	10	9	0.2	Diameter ranges 400-510nm	
20	12	12	0.35	Not desired range diameter	
20	14	16	0.5	Not desired range diameter	

**Conclusions:** The fabrication of polymeric nanofibers was fully comprehended by all the variables and was further evaluated for in vitro and in vivo studies to understand the sustained release of anti-tumor drugs.

## Global Neurosurgery

ePoster presentation

The Groote Schuur Hospital Neurosurgical Intensive Care Unit: a 2 year review of admission characteristics

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**Objectives:** To provide a detailed descriptive analysis of the demographics, diagnosis and management of patients admitted to the Neurosurgical Intensive Care Unit (NsICU) at GSH from 1st January 2020 to 31st December 2021.

**Background:** At Groote Schuur Hospital, the NsICU is a 6-bed unit headed by a specialist neurosurgeon with extensive experience in Neuro-Critical Care working in close collaboration with intensivists from the Division of Critical Care. There is currently no detailed analysis of the demographics, diagnosis and management of patients admitted to the NsICU at GSH.

**Methods:** A retrospective descriptive analysis of patients who received treatment in the NsICU from 1st January 2020 to 31st December 2021.

**Results:** A total of 685 patients were admitted to the unit over a two-year period with a male preponderance (68.2%). The average age was 42.5 ( $\pm 17.2$ ) years. The most common neurosurgical diagnoses were traumatic brain injuries (39.6%), brain tumours (22.6%) and aneurysmal subarachnoid haemorrhages (9.9%). Emergency admissions comprised 76.6% of the total and 86.7% of admissions were admitted post operatively. Three hundred and seventy-two patients required mechanical ventilation (54.3%), 132 patients required both an intracranial pressure monitor (ICP) and brain tissue oxygenation monitor (19.3%), 86 had an external ventricular drain placed (12.5%), 50 patients required placement of a tracheostomy (7.3%) and 16 patients had only an ICP monitor placed (2.3%). The average duration of stay was 5.5 ( $\pm 1.3$ ) days and ICU mortality over 2 years was 11.1%.

**Conclusions:** The NsICU at GSH manages predominantly male trauma patients and a significant number of admitted patients require specialized invasive intracranial monitoring.



## Global Neurosurgery

Oral presentation

Can arcuate foramen variation of the atlas be an etiopathogenetic factor for a non-aneurysmal peri mesencephalic subarachnoid hemorrhage?

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**Objectives:** We aimed to investigate the relationship between arcuate foramen (AF) and peri mesencephalic subarachnoid hemorrhage (pmSAH).

**Background:** The etiology of angiogram-negative subarachnoid hemorrhage (SAH) is still unknown. The pmSAH is encountered in 50-75% of the angiogram-negative SAH cases. In the literature, case reports show that pmSAH develops due to jugular vein occlusion, abnormal drainage of the basal vein, stenosis of the vein of the Galen, spinal arteriovenous fistula, or after physical stress. These results support the venous origin of some pmSAHs. The AF is one of the atlas variations, and the vertebral artery (VA), vertebral venous plexus, perivascular sympathetic plexus, and suboccipital nerve pass through it. In children and adolescents, it is known that AF causes VA dissection by stretching and stroke by compressing the VA. This variation may also play a role in the etiology of pmSAH by compressing the suboccipital venous plexus and the perivascular venous plexus within it. However, studies on the relationship between AF and pmSAH have yet to be found in the literature.

**Methods:** The study was conducted with 150 subjects (Table 1). We retrospectively analyzed and compared the AF rates in computed tomography angiography sagittal sections of the patients diagnosed with pmSAH and patients

diagnosed with ruptured aneurysm (aSAH).

		n (%)
Gender	Male	78 (52,0)
	Female	72 (48,0)
Age	Mean±SD	49,28±11,64
	Median (Min-Max)	50 (14-75)
Group	SAH	100 (66,7)
	pmSAH	50 (33,3)
<b>aSAH Distributions</b>		
R aSAH (n=100)	Absent	37 (37,0)
	Present	63 (63,0)
L aSAH (n=100)	Absent	40 (40,0)
	Present	60 (60,0)
aSAH side (n=100)	R	40 (40,0)
	L	37 (37,0)
	Bilateral	23 (23,0)
<b>pmSAH Distributions</b>		
R pmSAH (n=50)	Absent	24 (48,0)
	Present	26 (52,0)
L pmSAH (n=50)	Absent	23 (46,0)
	Present	27 (54,0)
pmSAH side (n=50)	R	23 (46,0)
	L	24 (48,0)
	Bilateral	3 (6,0)

aSAH: aneurysmal subarachnoid hemorrhage, pmSAH: peri mesencephalic subarachnoid hemorrhage, L: Left, R:Right  
 Table 1: Distribution of the descriptive characteristics

		Group		p
		aSAH (n=100)	pmSAH (n=50)	
Gender	Male	49 (49,0)	29 (58,0)	0,298
	Female	51 (51,0)	21 (42,0)	
Age	Mean±SD	48,31±12,31	52,22±10,02	0,150
	Median (Min-Max)	49,5 (14-72)	51,5 (32-75)	

Chi-Square Test, \*Student-t Test  
 aSAH: aneurysmal subarachnoid hemorrhage, pmSAH: peri mesencephalic subarachnoid hemorrhage  
 Table 2: Comparison of Descriptive Characteristics by Groups

		Groups		p
		aSAH (n=100)	pmSAH (n=50)	
R AF	Absent	36 (36,0)	15 (30,0)	0,465
	Present	64 (64,0)	35 (70,0)	
L AF	Absent	35 (35,0)	16 (32,0)	0,715
	Present	65 (65,0)	34 (68,0)	
Side	Absent	26 (26,0)	9 (18,0)	0,609
	R AF	9 (9,0)	7 (14,0)	
	L AF	10 (10,0)	6 (12,0)	
	Bilateral	55 (55,0)	28 (56,0)	

AF: arcuate foramen  
 Table 3: Comparison of Descriptive Characteristics by Groups

GROUP	R AF			L AF			
	Absent	Present	p	Absent	Present	p	
aSAH	Absent	15 (41,7)	22 (34,4)	0,468	17 (48,6)	23(35,4)	0,199
	Present	21 (58,3)	42 (65,6)		18 (51,4)	42(64,6)	
	Total	36	64	35	65		
pmSAH	Absent	6 (40)	18 (51,4)	0,459	11 (68,8)	12(35,3)	0,027*
	Present	9 (60)	17 (48,6)		5 (31,3)	22(64,7)	
	Total	15	35	16	34		

Chi-Square Test, \*p<0,05  
 Table 4: Relationship between AF and SAH in groups

**Results:** No statistically significant difference was found between the sexes, ages, and presence of AF in the cases according to the pmSAH and aSAH groups (Table 2-3). However, a significantly high correlation was found between left pmSAH and AF on the left side (Table 4).

**Conclusions:** The presence of AF should be investigated in patients with pmSAH. If AF is detected on the dominant VA side, decompression of the VA suggested to prevent the recurrence of pmSAH.

## Oncology

ePoster presentation

Spinal cord compression secondary to voluminous thoracic primary extraosseous Ewing's Sarcoma: an anecdotic and catastrophic disease. Separated combined approach and 1-year follow-up

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**Objectives:** To present a patient presenting with a severe Spinal Cord Compression(SSCC) due to a voluminous Ewing's Sarcoma(ES) requiring Posterior Cervical Decompression and Fusion and second-stage supraclavicular approach for complete tumor resection.

**Background:** ES is a rare osseous tumor, with an annual incidence of 3 cases per 1.000.000 people, mainly affecting large bones.Spinal Affection(SA) is anecdotic(less than 5% of all ES cases),including primary extra-osseous tumors with SA being no more than 13 cases reported in literature between 1969 and 2015. Typically,SA tumors present a highly aggressive histology compatible with Primitive Neuroectodermic Tumor(PNET),with a 5-Year-Overall Survival(SOS) of 70% with a complete resection and chemo-radiotherapy.

**Methods:** A 32-year-old patient presented to the Emergency Room with 48 hours progressive paraparesis associating bladder dysfunction.During admittance muscle power of mMRC 2/5 and C7-T1 sensitive level was evidenced.Urgent imaging revealed a thoracic-soft-tissue mass with C6-C7-T1-T2 spinal canal invasion and SSCC.

The patient underwent in a first-surgical-time C7-T1 laminectomy,tumor debulking and resection for decompression and C6 bilateral lateral-mass arthrodesis,C7 left unilateral pedicular screw due to right pedicular tumoral involvement and T1-T2 bilateral pedicular screw.

In a second time supraclavicular approach was performed evidencing voluminous tumor in pulmonary apex completely involving right vertebral artery, and C6-C7-C8 right rootlets. Complete tumoral resection was achieved ligating right vertebral artery and cutting involved rootlets without evidence of changes in neuromonitoring or post-operative deficit.

**Results:** The patient did not present any surgical complication. He was discharged to a rehabilitation center and recieved high-dose chemotherapy.After 3 months the patient was able to walk independently.1-Year-Follow-Up PET and MRI revealed complete tumoral response.

**Conclusions:** SA of ES is a poor prognostic disease due to its highly-aggressive histology and neurological deficit onset.Surgery for decompression,cytoreduction and stabilization represents the cornerstone of treatment in intimate relationship with chemotherapy. We recommend close follow-up to evaluate tumor response, residual tumor behavior and spinal stability.

## Functional

Oral presentation

### Globus pallidus internus or subthalamic nucleus DBS for dystonia

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**Objectives:** To compare the efficacy of deep brain stimulation of the globus pallidus internus versus subthalamic nucleus in dystonia.

**Background:** The targets for dystonia has been varyingly used namely the GPi and STN, each with its own pros and cons. Though the experience with STN is quite large and is easily identifiable on MRI, GPi targeting is based upon the indirect parameters such as AC-PC line, internal capsule and optic tracts. During the learning curve of DBS many treating teams have used STN as the primary target for modulating the basal circuits. We also had gone through a similar learning curve. This is our attempt to analyze our outcomes over our learning curve with regards to STN-DBS and GPi-DBS for dystonia.

**Methods:** This is a retrospective analysis where the authors have taken the data of all the consecutive cases of dystonia treated with DBS of GPi or STN at our institute between January-2018-December-2022. Standardized assessment for dystonia and disability using BFMDRS scale were conducted before and after surgery at follow-up of at-least 6 months.

**Results:** The improvement for segmental dystonia(83.41%) was slightly higher than the generalised dystonia(65.96%) with least improvement in the multifocal group(11.08%)overall. However, this was reflected in GPi group(11) with mean improvement of 53.8 on BFMDRS scale with  $p=0.001$  while STN group(4) didn't show any improvement. In STN group there was good improvement in one patient at 81.5%, while another patient had shown improvement of 30.3% and two patients didn't show any improvement leading to less favourable outcome (mean difference=15.875  $p=0.226$ ). The segmental and generalised group demonstrated improvement of disability with less-favorable outcome in multifocal group. The average voltage required was 2.8 V[range=1.6–4.3V] in the GPi group compared with the STN group 3.9V-4.7V[range=2–9V] in.

**Conclusions:** GPi-DBS shows more consistent improvement in all forms of dystonia as compared to STN-DBS.

## Hydrocephalus

Oral presentation

Smartphone-based thermography to determine shunt patency in patients with hydrocephalus

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**Objectives:** The objective of this study was to determine if smartphone based FLIR One thermography is able to detect flow of CSF in patients with no clinical signs of shunt dysfunction.

**Background:** When shunt dysfunction is suspected, radiation exposure due to X-rays or a CT-scan is inevitable. Less invasive and more reliable methods are warranted. In this study we aimed to assess the usability of smart-phone based thermography to detect shunt patency in patients with hydrocephalus.

**Methods:** This prospective observational pilot study evaluated the use of smart-phone based video thermography to detect flow of cerebrospinal fluid in the shunt of 51 patients from the department of Neurosurgery at a tertiary referral institute. Patients with a shunt for hydrocephalus without the suspect of dysfunction were included in the study from December 2021 to May 2022.

**Results:** We included 51 patients with a mean age of 53.3 years. Of these patients 14 were male (27.5%) and 37 were female (72.5%). The most frequent cause of the hydrocephalus was the normal pressure hydrocephalus followed by the congenital hydrocephalus. Most patients (96%) had a ventriculoperitoneal shunt whereas two had a ventriculo-atrial shunt. In total 43 patient (84%) had a shunt on the right side and 8 patient (16%) had the shunt located on the left side. In 45 patients (88.2%) we observed a clear flow of cerebrospinal fluid in the cooled shunt trajectory.

**Conclusions:** The findings of this study indicate that in patients with a shunt to treat hydrocephalus the smart-phone based video thermography may be a safe and simple alternative to show shunt patency without the exposure to radiation.

## Spine

Oral presentation

### Surgical management of long-level intramedullary spinal cord tumors

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**Objectives:** Long-level intramedullary spinal cord tumors (LIMSCTs) cause complex treatment issues. However, LIMSCTs have rarely been analyzed separately. The authors reported a large case series of LIMSCTs and analyzed the clinical characteristics and treatment outcomes.

**Background:** Given that patients with long-level intramedullary lesions suffer more neurological deterioration and postoperative complications, some surgeons may choose conservative management. These conservative protocols cannot prevent disease progression. In addition, several studies have also noted that aggressive resection increases the overall survival of patients with intramedullary tumors. To date, the optimal management for LIMSCTs remains unclear.

**Methods:** The medical data of patients with LIMSCTs at our institution were retrospectively reviewed. Demographics, tumor size and location, pathology, extent of resection, and neurological functional status were collected.

**Results:** A total of 43 consecutive cases were included. 53.5% of LIMSCTs were ependymal tumors. All patients with ependymal tumors achieved gross total resection (GTR). 13% cases of ependymal tumors experienced postoperative neurological deterioration, and 66% of them showed an improvement at follow-up; 25.6% were low-grade astrocytic tumors. The rates of GTR, subtotal resection (STR) and partial resection (PR) were 63.6%, 27.3% and 9.1%, respectively. 27% cases showed postoperative neurological worsening, and 33% of them had an improvement at follow-up; 20.9% were high-grade astrocytic tumors. The excision rates were 44.4% for GTR, 44.4% for STR and 11% for PR, respectively. 55% cases showed postoperative neurological worsening, and none of them had an improvement at follow-up.

**Conclusions:** In this series, all LIMSCTs were gliomas. Aggressive tumor resection did not increase the risk of long-term functional deterioration in ependymal tumors and low-grade astrocytic tumors, but in high-grade astrocytic tumors, patients had a higher risk of neurological deterioration and difficulty in recovery. In ependymal tumors and low-grade astrocytic tumors, patients can achieve long-time survival after performing aggressive tumor resection.

## Oncology

Oral presentation

NYUMets-Brain: a massive metastatic brain cancer dataset for global use

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**Objectives:** To widely release the world's largest annotated brain metastases dataset to date, including imaging and clinical data, with longitudinal follow-up.

**Background:** Applications of artificial intelligence in healthcare are challenged by medical data restrictions and limited interpretability. New norms for healthcare data sharing and structure are essential to maximize this technology's positive impact and improve outcomes.

**Methods:** Data for all patients with metastatic brain cancer treated with stereotactic radiosurgery (SRS) at NYU since November 2012 were collected from separate internal sources: a prospective radiosurgery clinical registry, SRS planning software, electronic health records, and picture archiving and communication system (PACS). After removal of identifying information, over 100 clinical variables were derived for each patient, including demographic details, clinical and disease-based characteristics (tumor histology, symptoms, functional status, prior treatments), many tracked through time. All prescribed medications were organized by time. MRIs, both treatment and follow up imaging, were resampled to 1mm isotropic dimensions and pre-processed, including skull stripping. The deidentified dataset was uploaded to Amazon S3 for distribution.

**Results:** This dataset consists of 1429 patients with an average of six MRI studies obtained over an average of 17 months of follow-up per patient. The dataset includes 8003 MRIs, including 2,367 MRIs with expert segmentations based on real-world SRS treatment plans for more than 12,000 individual metastases. The entire dataset, codebase, trained model weights, and a data interface were released for public researcher access.

**Conclusions:** NYUMets-Brain is the largest open dataset of annotated brain tumor imaging to date: it can be accessed at [nyumets.org](http://nyumets.org). The dataset itself serves as a public benchmark and valuable source of clinical data for study of metastatic brain cancer and development of AI models. Additionally, its development serves as a model for open healthcare data to collaboratively drive innovation.

## Spine

Oral presentation

The role of tertiary neurosurgical intervention in non-missile penetrating injuries of the spine

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**Objectives:** 1. To determine whether all patients with spinal non-missile penetrating injuries (NMPIs) need to be managed at a tertiary neurosurgical centre.

2. What is the surgical conversion rate for patients with NMPI?

**Background:** Non-missile penetrating spinal cord injury is a rare type of injury globally with South Africa reporting the highest incidence. Majority of these patients have prolonged hospital stay with a negative impact on the health system hence the need to assess the need for tertiary care.

**Methods:** A retrospective analysis of clinical, demographic, and imaging records was performed on all NMPI patients referred

to the Department of Neurosurgery at Tygerberg Academic Hospital in Cape Town, South Africa, between 1 January 2016

and 31 December 2019.

**Results:** Ninety-six patients were identified (94 males and 2 females) with 35 cervical, 60 thoracic, and 1 lumbar spinal stab. Eighty-six had an incomplete spinal cord injury. Six patients presented with cerebrospinal fluid (CSF) leak, all of which resolved spontaneously. MRI was performed in nine patients. Six patients had retained blades, of which 5 were removed in the emergency room (ER). Surgery was performed in two patients (cervical intramedullary abscess and a retained blade). Two patients developed meningitis, and one an intramedullary abscess. Twenty-two patients had associated injuries (pneumothorax, bowel injury). The average length of stay was 17 days, with 81% being unchanged neurologically. The average time from discharge to leaving the hospital was 11 days.

**Conclusions:** Early management of NMPI should include prophylactic antibiotics and wound debridement and X-ray imaging

to exclude retained blades. Bowel and lung injury must be managed accordingly. Tertiary neurosurgical referral is not routinely necessary and is only warranted for deteriorating neurology, retained blades not removable in the ER, and respiratory failure secondary to spinal cord injury. Complications include meningitis and persistent CSF leak, which should be referred timeously.



## Oncology

ePoster presentation

### Primary Intracranial Alveolar Soft Part Sarcoma (PIASPS): a systematic review of case reports

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**Objectives:** To determine the clinical manifestations, natural progression and management of primary intracranial alveolar soft part sarcoma.

**Background:** Alveolar soft part sarcoma (ASPS) is a rare malignancy of the lower extremities considered to be of unknown cellular origin. Common in young female patients, the ASPS usually has a strong metastatic potential, mostly involving the lungs at the time of presentation. Cases involving the central nervous system (CNS) primarily, without any evidence of systemic disease have emerged i.e. the primary intracranial alveolar soft part sarcoma (PIASPS).

**Methods:** After a extensive literature search using PubMed Central, Google Scholar and Scopus, seven case reports and two case series of 14 patients with PIASPS were retrieved and included using the Preferred Reporting Items for Systemic review and Meta-analyses (PRISMA) guidelines.

**Results:** Female preponderance of the neoplasm (57.14%) with the mean age of 24.9 years was noted. Headache (36.36%) and papilledema (25%) were the most common presenting complaint and sign, respectively. Brain parenchymal involvement was noted in 71.42% cases, mostly the frontal lobe and left hemisphere. The lesion appeared isointense to hypointense on T1-weighted images and hyperintense on T2-weighted images (66.67%) on Magnetic Resonance Imaging. Meningioma was often confused with PIASPS, by clinicians. Gross Total Resection was possible in 57.14% lesions. On immunohistochemistry, the tumorr cells manifested TFE3 and PAS positivity in 25% and 20% of the cases respectively. An average survival after follow up duration was found to be 31.79 months.

**Conclusions:** Surgery and radiotherapy are the mainstay of treatment of PIASPS, while meningioma an important differential diagnosis. TFE3 fusion product is readily been helpful in diagnosis. Evidence of a primary lesion in the CNS cannot rule out the presence of an occult primary elsewhere in the body. This, along with the slow growing nature of the neoplasm and delayed localized recurrences, require a long-term follow-up.

## Skull Base

Oral presentation

### Generation and applications of synthetic computed tomography images for neurosurgical planning

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**Objectives:** To develop a deep learning conditional generative adversarial network (cGAN) which synthesizes computed tomography (CT) head images from magnetic resonance imaging (MRI) sequences. To quantitatively evaluate the performance of cGAN across skull base structures.

**Background:** CT and MRI provide complementary information for neurosurgical planning. Though both modalities provide unique datapoints, acquiring a CT after an MRI adds to cost and exposes patients to additional ionizing radiation. The synthesis of high-resolution CT images from MRI represents a potential solution.

**Methods:** Pre-operative paired CT and contrast-enhanced MRI images were collected for patients with solid intracranial tumors (meningiomas, pituitary tumors, vestibular schwannomas) and non-oncologic conditions. CT/MRI images were denoised, field corrected, and co-registered. A cGAN was constructed to convert MRI images to "synthetic" CT images. Accuracy was quantified using the structural similarity metric (SSIM), dimensions of the sella/internal auditory canal (IAC), and aerations of the mastoid, clinoid, and sphenoid.

**Results:** 88 patients were identified with 65,043 paired CT/MRI images (80 patients) used for training/testing and 10,068 paired images (8 patients) used for external validation. Synthetic CT images reconstructed the bony skull base and convexity with high accuracy (validation SSIM:  $0.8822 \pm 0.039$ ). Skull base regions of the sella and IAC had high concordance between synthetic and ground truth CT images (error:  $0.081 \pm 0.072$ ), with IAC reconstruction showing more variability. While aerations were reconstructed in the mastoid, clinoid, and sphenoid regions, variability was seen across finer air cell septations. Synthetic CT images had differential performance across pathology, with the greatest limitation seen in tumors with calcification or bony invasion.

**Conclusions:** Our analysis demonstrates proof-of-concept for generating CT scans from MRI with a wide range of applications and pre-operative implications. cGAN performance likely needs to be optimized on specific pathologies or anatomical regions to improve its clinical performance.

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## Skull Base

Oral presentation

Clinical benefits of facial nerve monitoring during cerebellopontine angle surgery

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**Objectives:** To assess the impact of monitoring techniques on the preservation of facial nerve function during cerebellopontine angle tumours surgery.

**Background:** The surgery of cerebellopontine angle tumors has remarkably progressed over the last 2 decades due to improved microsurgical techniques. The primary operative goals are microscopic total removal of the tumor while securing the adjacent cranial nerves. Facial Nerve plays a critical role in facial muscles function and one's cosmetic appearance, and its weakness can have profound implications on a patient's quality of life.

**Methods:** This is a prospective study. This study was conducted on 30 cases (2 groups, each had 15 patients) with CPA lesions that had undergone surgical excision of these lesions performed by retrosigmoid approach (Group A: the patients were operated under continuous intraoperative facial nerve monitoring (IOFNM) and Group B: the patients were operated without IOFNM). They were operated upon in neurosurgery departments at Al-Azhar university hospitals between August 2019 and August 2021.

**Results:** This study showed that excellent facial nerve function (HB Grade I and II) was higher in group A than group B, immediately and at 6-month post op (80% and 93% VS 53.3% and 66.7%). Intermediate (HB Grade III and VI) and Poor (HB Grade V and VI) facial nerve function was higher in group B than group A; both immediately and 6-month postop (46.7% and 33.3% VS 20% and 6.6%). However, no statistically significant P-Value between both groups.

**Conclusions:** We concluded that IOFNM can help, but cannot guarantee, the preservation of facial nerve. Furthermore, it is merely a technical adjunct and does not replace surgical skills, knowledge of anatomy and experience.

## Oncology

ePoster presentation

Giant Cerebellopontine Angle (CPA) neoplasms: a descriptive experience of six years from a tertiary care hospital of a low-middle-income country

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**Objectives:** To determine the epidemiology, surgical management and post-operative sequelae of giant cerebellopontine angle (CPA) neoplasms.

**Background:** The most common location for tumors in the posterior fossa is the CPA. Nearly ten percent of all cerebral neoplasms are these tumors. Numerous studies have been published on surgical outcomes. However, the majority of these studies included tumors with a mean size, not more than 20 mm. Our study would provide an insight on how on dealing CPA neoplasms greater than 30 mm.

**Methods:** This retrospective, cross-sectional study was conducted at the Department of Neurosurgery, Unit-III, Punjab Institute of Neurosciences, Lahore, Pakistan from 2017 to 2022, involving 354 adult patients, who underwent retrosigmoid excision of space occupying lesions in cerebellopontine angle. Data was collected for demographics, clinical presentation, surgical findings, histopathology and post-procedural sequelae onto a questionnaire generated via Google Forms from the records of patients.

**Results:** Out of the total 354 patients, 57.30% were females, while 42.7% were male patients. About 57% patients had right-sided and 40.11% had left-sided neoplasms. Hearing loss was the main presenting complaint, with 73% of the patients having non-serviceable hearing. Gross total tumor excision (GTR) was achieved in 97.17% of patients based on postoperative imaging. Schwannoma was the most commonly reported neoplasm on histopathology, i.e. 70% cases. Postoperative facial nerve dysfunction was the most commonly noted complication in 62.71% patients (House Brackmann Grade III), followed by cerebrospinal fluid (CSF) leakage in 7.62% and post-operative bacterial meningitis in 3.67% cases.

**Conclusions:** Suboccipital retrosigmoid approach is best-suited for giant CPA neoplasms. The size of the tumors has a great impact on the kind of resection and post-operative functional integrity of cranial nerves VII and VIII.

## Skull Base

ePoster presentation

### Surgical outcomes and complications of tuberculum sellae meningiomas; a 10-year survey in a tertiary center

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**Objectives:** The aim of this cross-sectional study was Surgical Outcomes and Complications of Tuberculum Sellae Meningiomas (TSM) surgery.

**Background:** Tuberculum sellae meningioma (TSM) is a challenging brain tumor due to its critical anatomical position in the skull base. Following gradual and slow growth, these meningiomas move the optic chiasm and the optic nerve to the outside. The most common clinical finding in these patients is a gradual visual impairment which can be due to the compressive effect of the tumor on the nerves, optic chiasm, or blood supply, and disorder of these vital structures can affect both visual field and visual acuity.

**Methods:** In a retrospective study, all patients who underwent surgery for TSM tumors in the ten years from 2008 to 2018 were evaluated. Demographic information, imaging findings, clinical manifestations, surgical procedure, and factors affecting patients' outcomes, especially visual function, were evaluated.

**Results:** A total of 83 patients underwent TSM removal surgery during the study period, with a mean age of 54.1 years. 62 patients (74.70%) were female, and 90.3% had visual dysfunction symptoms, of which 51 patients (68%) had this symptom for over six months. The mean tumor size in patients was 3.8 cm, and 22 patients (26.5%) had vascular involvement. Of the 42 patients examined for endocrine, 23% had endocrine dysfunction. All patients had their tumors removed by transcranial approach, and the most common approach was lateral sub-frontal craniotomy (84.3%). Better visual function after surgery showed a statistically significant relationship with shorter visual symptoms, younger age, and smaller tumor size.

**Conclusions:** This study documented that visual dysfunction is the most common clinical symptom in TSM patients. The findings showed that patients with higher visual function before surgery, have smaller tumor sizes, and are younger have a better prognosis, which is coordinated with most studies' results.

## Oncology

Oral presentation

### Spatial distribution of meningiomas: a magnetic resonance image atlas

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**Objectives:** To use unbiased lesion mapping to localize intracranial meningioma distributions. To correlate meningioma spatial distribution with genotypic alterations and tumor grade.

**Background:** The anatomic location of meningiomas correlates with distinct clinical manifestations, histopathological subtypes, and surgical risk. In large tumors and those crossing compartments, meningioma anatomic origin sites can be obscured. We therefore sought to examine the spatial partitioning of meningioma.

**Methods:** MR images, World Health Organization (WHO) grade, and a molecularly Integrated Grade (IG) derived from cytogenetics were analyzed from 882 adults with pathology-confirmed intracranial meningiomas from a tertiary academic medical center. Semi-automated tumor segmentation was performed on pre-treatment T1-weighted contrast-enhanced MRI. We used voxel-based lesion mapping to generate a meningioma atlas with spatial distribution frequency and correlated this with tumor grade/anatomic origins.

**Results:** Of 882 patients (mean age: 57 ± 14 years, 68.8% female), 589 were WHO grade 1 (66.8%), 266 WHO grade 2 (30.1%), and 27 WHO grade 3 (3.1%). After molecular reclassification, 585 were IG-1 (66.3%), 160 were IG-2 (18.2%), and 137 were IG-3 (15.5%). Benign tumors were heavily concentrated in and around the midline anterior skull base. Malignant meningiomas were enriched in the falcine/parasagittal and the right sphenoid region. The spatial clustering of meningiomas was far more striking when stratified by the molecular Integrated Grade than by WHO grade. WHO grade 2 meningiomas divided equally across IG 1-3 by molecular criteria, with corresponding partition of spatial distribution in the midline anterior skull base (in WHO grade 2, IG 1) and falcine/parasagittal and sphenoid (WHO grade 2, IG3).

**Conclusions:** Using unbiased mapping, we demonstrate the preferential locations of intracranial meningiomas, with specific locations associated with more aggressive tumors. Distinct tumor distribution patterns emerged across both histopathologic and molecularly defined grades. Molecular grading associated with sharper spatial clusters of meningioma, supporting a phenotype-genotype association in meningioma.

## Endovascular Neurosurgery

ePoster presentation

The role for surgical rescue thrombectomy after failed endovascular thrombectomy in stroke: a case report

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**Objectives:** To report a case of rescue surgical thrombectomy after failed endovascular thrombectomy and discuss the need and indication for surgery in the era of endovascular stroke treatment.

**Background:** Since 2015, endovascular thrombectomy (EVT) has proven effective in several RCTs and become a game changer for stroke treatment. However, recanalization failure occurs in 10-25% of patients treated with EVT.

**Methods:** This is a case report of a 49-year-old, previously healthy woman, admitted with a NIHSS score of 17. The CT angiography revealed occlusion of the distal right ICA and proximal MCA. The arteries were recanalized with catheter aspiration. However, the distal M1 MCA segment remained occluded and after the second attempt with a stent retriever, vessel injury with contrast leakage was encountered (3.1 hours after ictus). Further EVT attempts were aborted, even though the M1 MCA segment was still occluded and the pial collateral circulation was poor. Further treatment options were discussed, including:

- 1) conservative treatment;
- 2) ultra-early hemicraniectomy;
- 3) open surgical vessel repair and thrombectomy for recanalization.

There was consensus to proceed with immediate open surgical thrombectomy. Under general anesthesia, a standard trauma-flap skin incision was performed with the option for hemicraniectomy. The Sylvian fissure was split, bleeding occurred from the endovascular vessel injury site and was repaired with a 9-0 stitch. The MCA bifurcation was opened with a longitudinal incision, and the thrombus removed. Flow was re-established 7 hours after ictus and 64 min after skin incision.

**Results:** At three months follow-up the patient had a mRS of 1 and NIHSS 0. She was fully able to return to her previous working position at 4 months.

**Conclusions:** High-volume stroke centers with neurosurgical expertise should remain alert to the possible application surgical rescue procedures and able to secure a seamless patient pathway when conversion to open surgery is needed.

## Global Neurosurgery

Oral presentation

Towards a common language in neurosurgical outcome evaluation: the NEON (NEurosurgical Outcome Network) proposal

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**Objectives:** The aim of this study was to achieve a consensus on the minimum set of outcome measures and predictors to be used in the neurosurgical practice and on the timing of outcome assessment.

**Background:** Shared protocols regarding general outcome measures for neurosurgical operation have not been clearly established despite measuring outcome is mandatory for improving surgical results.

**Methods:** A consensus building approach was employed. All neurosurgical departments in Lombardy (Italy) were invited to participate by the Carlo Besta Neurologic Institute IRCCS Foundation. Three workshops were organized during which a multidisciplinary group called Neurosurgical Outcome Network (NEON) was created and the methodology to select outcome measures, predictors, and timing of outcome assessment was established. Eight working groups were created for the different neurosurgical diseases (neuro-oncological, skull base, vascular, traumatic, spinal, peripheral nervous system, malformation, functional) and 8 related workshops were organized to identify the outcome measures and predictors specific for each of the neurosurgical diseases based on the experts' clinical practice and the existing literature.

**Results:** A total of 20 neurosurgical departments participated in this study. Specific outcome measures, predictors and the timing of outcome assessment were identified for each of the 8 neurosurgical diseases. Moreover, a list of variables common to all pathologies was identified by the NEON group as further data to be collected.

**Conclusions:** A consensus on the minimum set of outcome measures and predictors and the timing of outcome assessments for 8 neurosurgical diseases was achieved by a group of neurosurgeons of the Lombardy region, called NEON. These sets could be used in future studies for a more homogeneous data collection and as a starting point to reach further agreement also at national and international level.



## Oncology

Oral presentation

Contemporary molecular landscape, survival and prognostic features of over 4,000 gliomas

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**Objectives:** To characterize contemporary genetic signatures and outcomes of gliomas and identify prognostic features.

**Background:** Molecular classification has refined prediction of outcome, prognostic features, and response to treatment of gliomas. We sought to define these variables in a large multi-institutional contemporary cohort.

**Methods:** We extracted TCGA (n=770) and multi-institutional (n=3,546) molecular and clinical data. We classified gliomas classified using contemporary definitions (WHO 2021/cIMPACT-NOW) and examined the co-occurrence of key canonical and prognostic features, including *MGMT* methylation, *IDH1/2* mutation, and 1p19q codeletion across age groups.

**Results:** We analyzed 4,316 patients (median age 52yrs, 41% female), with 2,155 glioblastoma, 1,199 *IDH1/2*-mutant astrocytoma, 531 oligodendroglioma, and 343 other *IDH1/2*-wildtype gliomas. Molecular classification altered 27.2% of gliomas from their original assigned histopathologic designation. Glioma subtypes harbor canonical alterations, some of which uniquely correlate with clinical features. Alterations in tumorigenic pathways were often mutually exclusive. Incidence of *IDH1/2*-mutation and 1p19q-codeletion decreased with age, while incidence of *MGMT* methylation remained relative stable across age amongst assayed gliomas. Interestingly, among patients >65yrs with *IDH1/2*-mutation, 87% were *MGMT*-methylated, significantly greater than young adults (54%, p<0.001). Notably, *MGMT* methylation was largely assayed in high-grade gliomas and only 28% of low-grade gliomas. Patients from multi-institutional cohorts demonstrated improved median survival than TCGA patients (p<0.001). In glioblastomas, age, *CDKN2A/B* homozygous deletion, and *NF1* alterations were negatively prognostic. Chemotherapy, *MGMT* methylation, and 19q-gain were protective. In *IDH1/2*-mutant astrocytoma, *CDKN2A/B* homozygous deletion, *CCND2* alteration, *EGFR* amplification, *PDGFRA* alteration, 9p-loss, and 10q-loss were negatively prognostic.

**Conclusions:** Glioma patients are surviving longer in recent decades. Certain favorable molecular features decrease with older age of glioma diagnosis, while the *MGMT* methylation marker of temozolomide response remains relatively stable across age. We present an updated view of subtype-specific molecular and clinical prognostic features to help guide counseling of glioma patients in the contemporary era.

## Global Neurosurgery

Oral presentation

Investigation of the efficacy of bevacizumab treatment in an experimental rat model of chronic subdural hematoma

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**Objectives:** The study aims to identify an alternative option for medical treatment of chronic subdural hematoma (CSDH) and to investigate the immunologic properties of bevacizumab on rat model to gain insights into pathogenesis of CSDH for development of more effective treatment modality.

**Background:** An increasing incidence of CSDH in the elderly population necessitates exploring potential treatment options for patients ineligible for surgery. This study investigates the efficacy of bevacizumab, a monoclonal antibody targeting human vascular endothelial growth factor (VEGF), compared to combination of dexamethasone plus atorvastatin (DEX-ATO) treatment in a rat model, considering an alternative pathophysiological mechanism.

**Methods:** Ninety-five rats were divided into four groups of 18 animals: sham operation, control hematoma, DEX-ATO, and bevacizumab (23 rats excluded). Subdural injections of autologous blood (400µl + 300µl) were administered at 72-hour intervals, except for the sham group. VEGF-A, VEGF-C, VEGF-D, interleukin-6, and interleukin-8 levels were measured using ELISA and immunohistochemical analysis on days 7, 14 and 21. Body weights were recorded weekly and volumes of hematoma and surrounding tissue were also quantified.

**Results:** We found that hematoma volume decreased over time in all groups ( $p < 0.002$ ), while volume of control hematoma group was significantly higher than medically treated groups ( $p < 0.003$ ). Interestingly, DEX-ATO induced greater weight loss than bevacizumab ( $p < 0.01$ ), while bevacizumab exhibited weight changes similar to the sham group. Furthermore, both treatments showed comparable anti-inflammatory effects in VEGF and cytokine profiles. Hematoma volumes reduced over time in all groups ( $p < 0.002$ ), with significant reductions in bevacizumab and DEX-ATO groups ( $p < 0.001$  and  $p < 0.020$ , respectively). Bevacizumab caused more reduction in the volumes of both hematoma and lesion, though not statistically significant.

**Conclusions:** It is concluded that bevacizumab is an effective agent for reduction of hematoma volume, as did in conventional treatment modalities, with additional neuroprotective effects and better tolerability of bevacizumab as an alternative option for treatment of CSDH

## Global Neurosurgery

Oral presentation

Three-dimensional custom-made porous polyethylene cranioplasty in patients at high risk for surgical site infection - mono-institutional study

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**Objectives:** The aim of our study was to verify the assumed low incidence of surgical site infection (SSI) after porous polyethylene cranioplasty in patients at high risk for SSI.

**Background:** Cranioplasty is accompanied by a high incidence of complications. A common complication is SSI with an incidence of 1.4 - 24.4%. The optimal material for cranioplasty in terms of the incidence of infection remains unclear. Porous polyethylene is a modern material associated with a low risk of infection, but has not yet been included in any meta-analyses.

**Methods:** We prospectively evaluated a group of 21 patients over the period 2014 – 2022, who underwent secondary three-dimensional (3D) custom-made cranioplasty from porous polyethylene. Patients at high risk for SSI were defined through risk factors: previous infection with the need for removal of an autologous bone flap or implant, bone flap resorption, repeated revision surgeries, open frontal sinus. The incidence of SSI and exposure of the implant were assessed. The objectives were evaluated using physical examination and computed tomography.

**Results:** Twenty-one operations were performed on 21 patients. In 16 cases, cranioplasty was performed after decompressive craniectomy and in five cases after craniotomy of limited size. Seven patients had one risk factor and 14 patients had a combination of two risk factors. The mean follow-up was 48 months (12-96).

Neither infection nor implant exposure was detected in any patient in our group.

**Conclusions:** We have confirmed the minimal risk of infection or implant exposure after 3D custom-made cranioplasty with porous polyethylene, even in patients at high-risk for SSI. Further clinical studies with better evidence could confirm our conclusions.

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## Trauma

Oral presentation

### Factors influencing septic complications in open skull fractures

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**Objectives:** To determine the factors affecting the incidence of septic complications in open skull vault fractures and to quantify those effects.

**Background:** Open skull fractures can develop life-threatening infective complications. Prophylactic antibiotic use and intervention times are not clearly defined, as well as how mechanism of injury and weapon used relate to sepsis. Current guidelines are derived from mainly traffic related incidents in high-resource environments (sepsis rates of 3.5% and 4.9% in 1972). The study aimed to identify factors affecting septic complications in open skull fractures in the largest series to date.

**Methods:** A retrospective analysis of a prospectively maintained database was done to assess demographic data, clinical and imaging findings, and diagnostic and treatment timelines of all adults admitted to a tertiary neurosurgical service with open skull fractures between 1 January 2018 and 31 December 2021. In-hospital outcome was defined with the extended Glasgow Outcome Score (GOSE).

**Results:** 605 open skull fracture patients were identified with 569 included. Overall mortality rate was 4% (n=23) with 7 deaths due to septic complications. Assault was the mechanism of injury in 95%(n=540), 4% traffic related incidents and 1% due to falls. The overall sepsis rate was 22.3%. Prophylactic antibiotic administration significantly reduced septic complications (p<0.001). Wound contamination, air sinus involvement and time to primary wound closure are significant risk factors for developing septic complications in both uni- and multivariate analysis. Hammers had the lowest sepsis rate (9.5%), with golf clubs and wooden implements the highest risk (36.4 and 45%). Time to definitive surgery >24 hours increased the sepsis rate from 2.3% to 26.4%.

**Conclusions:** Time to wound closure and definitive surgery > 24 hours, CT evidence of wound contamination and air sinus involvement, and lack of administration of prophylactic antibiotics contribute significantly to developing septic complications in open skull fractures.

## Trauma

ePoster presentation

### Golf club assault resulting in compound skull fractures

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**Objectives:** To describe the mechanism of injury, injury pattern and complications of golf club assault related skull fractures.

**Background:** Golf related traumatic brain injuries are mostly encountered in children. The use of golf clubs as a weapon of interpersonal assault resulting in compound skull fractures in adults are rare and due to the combination of high prevalence of interpersonal violence and a unique degree of income inequality in South Africa. Properties inherent in club design causes a characteristic injury pattern and produces conditions known to be risk factors for septic complications. We report the largest case series of golf club related compound skull fractures in adults secondary to assault.

**Methods:** A retrospective analysis of a prospectively maintained database for adults admitted with golf club related compound skull fractures admitted between 1<sup>st</sup> January 2018 to 31 December 2021 was done to assess demographic data, clinical and imaging findings, operative details, septic complications as well as length of stay (LOS) and outcomes defined according to Extended Glasgow Outcome Scale (GOSE).

**Results:** 21 patients were included. 95.2% of patients were male (n=20). The mean age of the patients was 32.6 years. The most common fracture area was the frontal bone (n= 9). 95.2% presented with depressed skull fractures (n=20). ICH was the most common intracranial injury (n=10) followed by SAH (n=2) and epidural haematoma (n=2). 5 Patients had superior sagittal sinus injury. Surgical debridement was required in 19 patients (90.4%) with 57.1% (n=12) having a dural injury. Mean surgical time was 80.7 minutes. Sepsis rate = 33.3% (n=7). 16 patients had good neurological outcomes and the mean length of stay (LOS) was 11.9 days.

**Conclusions:** Golf club related skull fractures are a product of unique socio-economic circumstances and produce a characteristic injury and complication pattern due to the physics principles of club design.

## Neurovascular Surgery

Oral presentation

Traditional and novel stroke risk factors in an indigenous population of Native Americans in the U.S.A

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**Objectives:** The objective of this study is to examine stroke risk factors in Native Americans (NA), which are at a higher risk for stroke. The second objective is to identify novel inflammatory proteins in this population at risk.

**Background:** NA have a higher incidence of stroke as compared to all other racial groups in the United States. Identifying treatable risk factors leading to stroke is imperative in this population. We hypothesize that traditional risk factors in this population are associated with novel inflammatory proteins, leading to generalized atherosclerotic risk.

**Methods:** Participants enrolled in the stroke prevention study in the Wisconsin NA Population (N=120) underwent a health history risk assessment (including age, BMI, blood pressure, health and family history), cognitive testing, carotid ultrasound to measure atherosclerotic load, blood assessments (total cholesterol, Triglycerides, LDL, non-HDL cholesterol, and Hemoglobin A1C), as well as a targeted proteomic profiling to identify circulating blood biomarkers. Linear regression models were used to identify statistically significant biomarkers compared to a control group of Non-Native Americans.

**Results:** Median age group was 66.5 years of age, 77% were female, 83.3% were identified at High Risk with three or more risk factors for stroke. 48.7% were diabetic, 54.9% had BMI >30, 65.6% were hypertensive, while 81.4% showed carotid atherosclerotic plaques. Of 58 novel inflammatory proteins studied, 26 were significantly elevated in NA as opposed to Caucasian population. Among NA, aging was significantly associated with alterations in 20 proteins. High Cholesterol levels were associated with 7 inflammatory markers. A1C correlated with increased fibrinogen, HGF, leptin, adiponectin, angiopoietin-like 3 in NA.

**Conclusions:** Both traditional and novel risk factors for stroke are prevalent in NA population. These novel circulatory inflammatory protein biomarkers show potential for use in diagnosis and prognosis in NA as well as being potential treatable targets to prevent stroke incidents.

## Oncology

ePoster presentation

### Metastatic atypical spinal meningioma: a rare case review

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**Objectives:** 1. To present a rare case of extracranial meningioma with pulmonary metastasis.

2. Discuss the neurosurgical aspects of the diagnosis and treatment for a such meningioma.

**Background:** Meningiomas are benign tumors of meningotheial origin. They make 25-46% of spinal tumors. Only 0.1-1% of intracranial and spine meningiomas develop distant metastases. Because atypical (WHO grade II) spinal meningiomas are rare there is lack of research on their diagnosis and treatment.

**Methods:** A 58 year-old female was presented to the neurosurgeon with lower back pain and non-specific findings on lumbar CT. MRI demonstrated a extradural 30 mm spinal lesion at Th12-L1 spina canal. Contrast enhanced CT found new mass in left lung. Interdisciplinary meeting decided for spinal tumor removal, that is followed by adjuvant radiotherapy and pulmonary lesion removal with a lymphadenectomy.

**Results:**

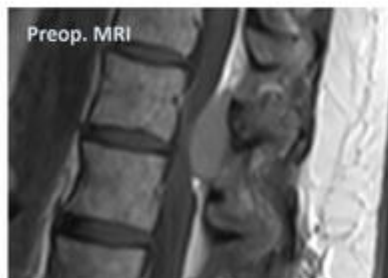


Fig. 1 Preoperative MRI. Lesion located at Th12-L1.

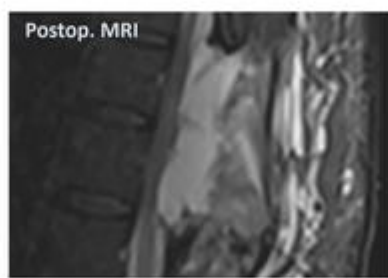


Fig. 2 Postoperative MRI.



Fig. 3 Metastasis visible in left lung.

Th12-L1 laminectomy was performed. Two months after laminectomy lung lobectomy was performed. Both - spinal and pulmonary lesions had pathohistological characteristics of a atypical (WHO Grade 2) spinal meningioma. As of June, 2023, the patient is in good health.

**Conclusions:** Though this tumor is exceedingly rare, modalities of radiographic imaging makes it possible to locate distal metastases of meningioma. Total resection is required for both treatment and diagnosis. There is no defined standard in primary extracranial metastatic meningioma treatment. Multidisciplinary team is vital for decision-making.

## Skull Base

Oral presentation

ePTFE sleeve microvascular decompression technique for trigeminal neuralgia and hemifacial spasm

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### Objectives:

- Description of some technical nuances and expose our Institution's experience with the ePTFE sleeve technique.
- Describe an operative surgical technique for microvascular decompression (MVD) for Trigeminal Neuralgia (Tn) and Hemifacial spasm (Hs).

**Background:** Primary Neurovascular compression syndromes (Tn and Hs) definitive treatment involves MVD with Teflon and Ivalon, notwithstanding exist some limitations, and sometimes is not available. With the ePTFE (inert, biocompatible, anti-adherent prosthetic material) sleeve technique could reach the same goal in terms of pain-free survival.

**Methods:** This study was conducted at Hospital Juarez de Mexico from 2017 to 2022 in patients with primary Tn and Hs approached with ePTFE sleeve and Teflon technique. Pre and postoperative assessments were performed for Tn with Barrow Neurological Institute pain intensity (BNI-SI) and Barrow Neurological Institute hypoesthesia scale (BNI-SH). Improvement was determined with BNI < IIIb for at least 3 months of follow-up. For HS we used the clinical symptoms pre and postoperative as reference.

**Results:** 23 patients were operated for Tn (n:19) and Hs (n:4). ePTFE sleeve technique was used in 9 (47%) patients for Tn, and it was used in 3 patients for Hs. For Tn, both groups (Teflon and ePTFE) were operated with BNI-SI IV (58%, n=11), and BNI-SI V (42%, n=8), which recovers after the MVD (p:0.007) obtained in all patients BNI < IIIb, without differences in each group (p:0.356). No differences were found with BNI-SH pre and postoperative. All hemifacial spasm patients recover after the surgical treatment with no clinical symptoms.

**Conclusions:** MVD with ePTFE sleeve technique is an optional useful strategy for Tn and Hs, and it could be used as an alternative for Teflon or Ivalon technique if are not available. It could be useful for multi-vessel compression. The limitation is the low number of patients and the short time of follow-up.



## Trauma

ePoster presentation

### Association between short-term air pollution exposure and traumatic intracranial hemorrhage: pilot evidence from Taiwan

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**Objectives:** This pilot study evaluated the association between short-term air pollution exposure and traumatic intracranial hemorrhage (TIH).

**Background:** The detrimental effects of air pollution on the brain may increase the TIH risk among patients suffering traumatic brain injury (TBI).

**Methods:** Hospital data of patients with TBI following road traffic accidents in 2017 were retrospectively collected from five trauma centers. TIH was the outcome measure. All accident locations were geocoded, and air quality data were collected from the nearest monitoring stations. Air pollutants were entered into five multivariable models. A sensitivity analysis was performed on patients who are vulnerable to suffering TBI after road accidents, including motorcyclists, bicyclists, and pedestrians.

**Results:** Among 730 patients with TBI, 327 had TIH. The ages of  $\geq 65$  [adjusted odds ratio (OR), 3.24; 95% confidence interval (CI), 1.85–5.70], 45–64 (OR, 2.61; 95% CI, 1.64–4.15), and 25–44 (OR, 1.79; 95% CI, 1.13–2.84) years were identified as significant risk factors. In the best-fit multivariable model, exposure to higher concentrations of particulate matter  $\leq 2.5$   $\mu\text{m}$  in aerodynamic diameter ( $\text{PM}_{2.5}$ ) was associated with an elevated TIH risk (OR, 1.50; 95% CI, 1.17–1.94). The concentration of nitrogen oxides ( $\text{NO}_x$ ) did not increase the risk of TIH (OR, 0.45; 95% CI, 0.32–0.61). After categorizing the air pollution concentration according to quartile, the trend tests in the multivariate model showed that the concentrations of  $\text{PM}_{2.5}$  and  $\text{NO}_x$  were significant ( $p = 0.017$  and  $p < 0.001$ , respectively). There was a negative borderline significant association between temperature and TIH risk (OR, 0.75; 95% CI, 0.56–1.00,  $p = 0.05$ ). Notably, the single-vehicle crash was a significant risk factor (OR, 2.11; 95% CI, 1.30–3.42) for TIH.

**Conclusions:** High  $\text{PM}_{2.5}$  concentrations and low temperatures are risk factors for TIH in patients with TBI. High  $\text{NO}_x$  concentrations are associated with a lower TIH risk.

## Trauma

ePoster presentation

### Complex cranioplasty with a CaTi-CAD implant – a single-center study

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**Objectives:** In such cases, cranioplasty is performed using a CAD implant. Here we would like to scientifically process our experiences with 50 cases with a CaTi-Implant.

**Background:** Cranioplasty continues to be an underestimated operation, especially in the case of wound infections or soft-tissue-destroying traumatic brain injury.

**Methods:** The aim of this study was to evaluate the usefulness and risks of CaTi CAD cranioplastic. For this purpose, we included all patients who received a xenologist cranioplasty between December 2020 and December 2022. We evaluated the available patient data regarding the infectiological and neurosurgical issues.

**Results:** In total, we were able to include 50 patients. The median age was 45.6 years (SD +/- 18.4 8 years). The gender distribution was 40% female. The main indications for CAD cranioplasty were open TBI (38%), multiple craniotomies (24%) and infections (21%). In 21% of cases, an existing cranioplasty (Palacos or CAD) was explanted and secondarily replaced by the CaTi cranioplastic. The cause was tumor recurrence with indication for renewed craniotomy or late infections after cranioplasty. The laterality was balanced. In one case, a bilateral CAD was necessary and in 7% of cases, a frontal plastic was necessary. The median follow-up is currently 12.7 months (SD +/- 6.3 months). No implant-associated complications occurred during the observation period. Due to infections (wound infection or ventriculitis), four cranioplasties had to be removed. Six additional implants had to be explanted due to mechanical complications, of which four implants were exposed by manipulation of the wound (scratching). Despite plastic surgical measures, two implants failed to achieve sufficient wound healing and had to be explanted as well.

**Conclusions:** Cranioplasty with a CaTi implant is a safe option in the field of complex cranioplasty.

## Education, Ethics, Socioeconomic

Oral presentation

Novel outpatient treatment strategy for cranial infections – a single-center experience

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**Objectives:** We aimed to report our initial experience with 40 patients who underwent outpatient intravenous antibiotic therapy.

**Background:** Considering the recommendation for extended antibiotic treatment for cranial infections, our clinic investigated the feasibility of outpatient intravenous antibiotic administration.

**Methods:** We conducted a retrospective study to evaluate the effectiveness of outpatient antibiotic therapy in cranial neurosurgery. We included all patients who received a peripherally inserted central catheter (PICC) for intravenous antibiotic therapy for cranial infection, specifically intracranial abscesses, between January 2020 and December 2022. We reviewed patient data pertaining to infectiological and neurosurgical factors. All patients were treated with intravenous antibiotics for a minimum of six weeks both as inpatients and outpatients.

**Results:** A total of 40 patients were included in the study. The median age was 59.88 years (SD +/- 13.39 years), and 40% of patients were female. The average inpatient stay duration was 18.4 days (SD +/- 4.97 days), whereas subsequent outpatient antibiotic therapy lasted an average of 71.7 days (SD +/- 23.18 days). Outpatient intravenous therapy accounted for 53.88 days (SD +/- 18.56 days). Staphylococcus epidermidis and cutibacteria were the most common pathogens, while microbiological processing failed to detect any pathogen in 9% of cases. Radiographic and laboratory chemical evidence of active inflammation was absent in all patients at the final control. During outpatient intravenous therapy, 12% of patients experienced PICC line patency issues, which were resolved radiologically. Furthermore, one patient showed structural epilepsy with scarring abscess healing independent of therapy.

**Conclusions:** Outpatient IV antibiotic therapy via a PICC line catheter is a safe and effective option for cranial infections, especially for prolonged antibiotic treatment.

## Spine

Oral presentation

### Treatment of spinal metastasis in the 21st century

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**Objectives:** This study aimed to compare the quality of life and the overall survival between patients following surgical Instrumentation and radiotherapy and radiotherapy alone for spinal metastases.

**Background:** Spinal metastases may present with different degrees of mechanical instability. The Spinal Instability Neoplastic Score (SINS) was developed to assess spinal neoplastic-related instability.

**Methods:** This study aimed to compare the quality of life and the overall survival between patients following surgical Instrumentation and radiotherapy and radiotherapy alone for spinal metastases. The study design was a matched-pair analysis according to the SINS-Score, the sex, the age, the histology and the "Karnofsky Performance Index".

**Results:** Thirty-five patient per group were identified. Median age was 66 SD +/- 14 and 60% were female. Most common Histology was breast cancer and was seen in 38% followed by bronchial cancer in 14% of cases. Unstable and potentially unstable fracture were seen in 74% and 26%, respectively. The overall survival was 57% and 75% in the radiotherapy and the surgery and radiotherapy group, respectively. Analyzing the quality of life, we choose the walking ability as a main feature. Ninety-two percent in the interventional group are still able to walk, in contrast 80% in the conservative group. (P= 0.24)

**Conclusions:** Tailored surgical approach according to the SINS score results in longer overall survival and higher rates of preservation of walking ability in patients with spinal metastases.

## Endovascular Neurosurgery

ePoster presentation

### Middle meningeal artery embolisation for treatment of chronic subdural hematoma: a systematic review and meta-analysis

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**Objectives:** The role and indication of MMAE in the management of CSDH remains unclear. This systematic review and meta-analysis aim to evaluate the role of MMAE in the treatment of CSDH.

**Background:** Surgical drainage is a common treatment modality for CSDH. However, surgical evacuation of CSDH is not without a fair share of complications such as post-operative acute SDH or recurrence of CSDH, especially in those with coagulopathy. Embolization of the middle meningeal artery (MMAE) has emerged as a minimally-invasive modality with some promising results in recent years. At the same time, it has also demonstrated itself as a relatively safe procedure with low rate of complications reported.

**Methods:** Electronic search was done up till 31<sup>st</sup> Jul 2021. The inclusion criteria for this study included: (1) randomized or non-randomized studies with the diagnosis of CSDH (New CSDH or recurrent/refractory CSDH), (2) Studies with patients who were treated with MMAE or with surgical interventions. Key outcomes of interest included increased size of hematoma on follow-up, mRS score, recurrence rate, re-operation and complications rate.

**Results:** 9 studies comparing outcomes of MMAE with that of surgical drainage were included (321 patients in the MMAE group, 1193 patients in ST group). MMAE as adjunctive treatment in addition to surgical drainage is associated with lower recurrence rate of 5.3% than ST group 16.9% (OR=0.29, 95%CI 0.15-0.55 p=0.0002, I2=0%), less need for repeat surgical drainage, 4.3% compared to 10.1% (OR=0.35, 95%CI 0.17-0.72, p=0.004, I2=0%). Treatment of CSDH with MMAE as sole upfront treatment favoured MMAE (1.9%) over ST group (18.3%) (OR=0.11, 95%CI 0.02-0.67, P=0.02, I2= 0%) and showed a trend towards less need for surgical salvage (OR=0.46, 95%CI 0.19-1.08 p=0.08, I2=48%).

**Conclusions:** MMA embolization as an adjunctive therapy after surgical drainage for CSDH is associated with lower probability of recurrence and subsequent need for surgical rescue compared to surgical management alone.

## Global Neurosurgery

ePoster presentation

Implementing an ICT imaging consultation mobile app in a prefecture with significant healthcare disparities

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**Objectives:** We retrospectively evaluated how a mobile app lication functioned and was used when implemented in our medical networks.

**Background:** Telemedicine, the application of information and communication technology to medical care, is expected to be a solution to medical disparities. Recent technological advances have made it possible to view images and other medical information more quickly and provide more practical and accurate medical care via mobile applications. Thus, we attempted to establish a telemedicine network based on a mobile application covering the entire prefecture we resided in.

**Methods:** We introduced a mobile imaging consultation system between our hospital and an affiliated hospital in Hokkaido, which is the largest prefecture in Japan. We intended to build a medical collaboration network using the smartphone-based program, which was a communication application that can be utilized on a new generation of smartphones and can also run on a PC.

We were able to share information and images in DICOM format at any time, anywhere. We retrospectively examined the number of times and the diseases for which the mobile application was used in this system from 2019 to 2022.

**Results:** There were no security issues or communication failures during this period. There were 38 consultations for brain tumors and 84 consultations for cerebrovascular disorders. In addition, there were 25 consultations for clinical trials. The inter-facilitation consultation was performed in 108 cases.

**Conclusions:** The mobile application enabled safe and quick image consultation and is expected to be used in the neurosurgical field. It is also expected to be used as a tool to correct healthcare disparities, as it allows for easy consultation between hospitals.

## Neurovascular Surgery

Oral presentation

Middle communicating artery bypass as rescue option for complex MCA aneurysms: a report of two cases and discussion of concept

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**Objectives:** To report the concept of middle communicating artery bypass as rescue option for complex middle cerebral artery (MCA) bifurcation aneurysms and discuss its role in the era of endovascular treatment.

**Background:** Broad-based MCA bifurcation aneurysms involving the outflow segments of the branching arteries are difficult to reconstruct. Bypass strategies have mostly focused on trapping or partial occlusion, requiring revascularization with interposition grafts. This may not always be a feasible option.

**Methods:** *Case 1* was an elective clip reconstruction of a complex MCA bifurcation aneurysm in a 61-year-old man. Postoperatively, he experienced episodes of fluctuating hemiparesis and aphasia. CT perfusion and cerebral angiogram demonstrated hypoperfusion due to outflow stenosis in the frontal M2 trunk which was not salvageable by clip adjustment. Side-to-side anastomosis between frontal and temporal M2 branches was performed to create a communicating segment, allowing sacrifice of the frontal M2 outflow segment and adequate clip reconstruction of the aneurysm. Perfusion was re-established and his symptoms resolved. *Case 2* was a 77-year-old man with a ruptured large, partially calcified left MCA bifurcation aneurysm. The aneurysm involved the frontal M2 outflow segment, preventing adequate clip reconstruction without vessel sacrifice. A communicating segment between the frontal and temporal M2 branches was created by side-to-side anastomosis and provided the means for a good clip reconstruction of the aneurysm with sacrifice of the frontal M2 branch.

**Results:** Patency of M2-M2 side to side anastomosis and adequate flow replacement was achieved in both cases and yielded a good post-operative outcome as well as complete aneurysm obliteration.

**Conclusions:** The concept of creating a communicating segment between frontal and temporal M2 branches preserves adequate perfusion and enables primary clip reconstruction of complex MCA bifurcation aneurysms. This can be performed in both acute and elective settings through a pterional craniotomy, without the need of an interposition graft.

## Paediatric

ePoster presentation

Initial experience in surgical management of 2 paediatric syndromic AAD cases using 3D printed module in a tertiary care centre

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**Objectives:** To assess the importance of 3D printed module in preoperative surgical planning of paediatric AAD cases.

**Background:** Atlantoaxial dislocation (AAD) causing compressive myelopathy in a paediatric age is well reported in literature. Larsen syndrome is inherited by both autosomal dominant and recessive patterns. It characterised by typical craniofacial dysmorphism, large joint dislocations, osteochondrodysplasia, congenital cardiac defects and short stature. It is commonly associated with scoliosis, C1-C2 instability and cervical kyphosis. We report 2 cases of syndromic AAD with its clinico radiological features and its surgical management using 3D printed module.

**Methods:** One of the cases was a 8 year female and the other 7 year male child. Patients were admitted and clinical examination were done. Modified JOA scoring for Cervical spine myelopathy pre- and post-surgery was done. Radiological investigations include MRI cervical spine with whole spine screening was performed. CT CVJ with cervical spine, vertebral artery angiogram with 3 D reconstruction was done. 3D printed reconstruction module made was used in preoperative surgical planning. Genetic and cardiology workup done and was managed accordingly.

**Results:** Both of our paediatric cases had C1 posterior decompression and C1-C2 fixation with reduction of AAD. 3D printed module helped us in preoperative surgical planning to avoid vertebral artery, transgressing the spinal canal and to plan the safe surgical trajectory of C1 and C2 screws.

**Conclusions:** 3D printed CVJ bone module helps in better preoperative surgical planning of screw trajectory in C1 and C2 fixation.



## Spine

Oral presentation

Efficacy of tranexamic acid in reducing blood loss in major lumbar spine surgery; randomized controlled trial in a Sub-Saharan centre

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**Objectives:** To determine the efficacy of tranexamic acid (TXA) in reducing blood loss and transfusion requirements (TR) in major spine surgery for degenerative spine diseases (DSD).

**Background:** TXA reduces blood loss and transfusion requirements in various specialities but use in spine surgery is rare in our environment, and none is conducted in our subregion in major spine surgery.

**Methods:** This was a parallel superiority randomized clinical trial carried out in Memfys Hospital Enugu, Nigeria, comparing the efficacy of TXA versus placebo for multilevel lumbar laminectomy and fixation surgeries for DSD. Consenting patients who met the inclusion criteria were allocated into two groups using stratified randomization method. The patients and surgical team were blinded. Group A (treatment group) received intraoperative TXA (2 one-gram doses given 3 hours apart), while Group B (control arm) received normal saline. The calculated blood loss (CBL) using the haemoglobin balance method (primary outcome) and TR (secondary outcome) were documented for both groups. The intention to treat principle was utilized for analysis. Study was approved by institutional board.

**Results:** Sixty-four patients (32 in each group) completed the study. There was male preponderance 1:1.3 with a mean age of 55.7±11.9 years. No statistically significant difference was noted between both groups' baseline and surgical procedure characteristics, including Age, BMI, surgery duration, laminectomy and fixation levels. There was reduction in CBL by 21.7% with TXA use, which was statistically significant( 1530.67 vs1955.30 MD 424.6mls CI 39.7-809.6 p=0.034), and the difference persisted after controlling for the covariates using ANCOVA. Group A had less TR (1.2vs2.3 units CI 0.25-1.90 p=0.009) and shorter hospital stay (8.1 vs11.8 days CI 0.73-6.67 p=0.017). There was no increase in the frequency of adverse effects related to TXA use.

**Conclusions:** TXA is a practical and effective method of reducing blood loss and transfusion requirements for major lumbar spine surgery for DSD in our subregion.

## Education, Ethics, Socioeconomic

Oral presentation

Correlation between objective results in cranial simulation and self-efficacy questionnaires over extended cranial procedures: could simulation guide surgical careers?

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**Objectives:** The objective of this study was to investigate the correlation between self-efficacy questionnaires and objective simulation performance metrics during tedious simulated neurosurgical procedures. Additionally, we aimed to assess the potential of utilizing simulation as a tool to aid in the selection of surgical subspecialties for improved surgical outcomes.

**Background:** Neurosurgery encompasses various subspecialties that require prolonged concentration and exceptional surgical skills. Inadequate patience or steadiness during extended procedures such as skull base surgery and massive tumor resections can lead to severe neurological complications. Computer-based simulation has been recognized as a valuable training method. This study aims to explore the correlation between self-evaluation questionnaires and objective simulation performance, evaluating its potential as a tool to guide surgical career paths.

**Methods:** We conducted a prospective analysis correlating validated questionnaires with performance metrics data obtained from 90 hours of simulation training involving 10 neurosurgery residents. Each resident participated 9 hours of simulation training. Four questionnaires, consisting of 5 validated questions related to the experience of lassitude, desire to abandon, attention maintenance, and perception of time passing, were administered pre-, inter-, and post-simulation. Participants performed two tedious exercises. Spearman correlation coefficient ( $\rho$ ) was used.

**Results:** Four questions out of five exhibited significant correlations with performance metrics. The experience of feeling lassitude in the operating room (OR) ( $\rho = -0.704$ ,  $p = 0.023$ ), the experience of desire to abandon during simulation ( $\rho = -0.714$ ,  $p = 0.020$ ), the feeling of not perceiving time passing during simulation ( $\rho = 0.688$ ,  $p = 0.028$ ), and the feeling of boredom during extended debulking exercises ( $\rho = -0.645$ ,  $p = 0.044$ ) demonstrated significant correlations with metric performance.

**Conclusions:** These findings suggest that simulation tools could serve as valuable indicators for identifying young surgeons who may excel in lengthy surgeries, emphasizing the importance of inherent qualities such as patience and consistency.

## Skull Base

Oral presentation

### Simultaneous combined endonasal and transcranial surgery for large skull base tumors invading multiple regions

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**Objectives:** Using simultaneous combined endonasal and transcranial surgery (SCENaTCS) for various skull base tumors requires clarification of the advantages and non-invasiveness of the approach over staged surgeries using either the same or a different surgical approach, especially for tumors invading multiple regions.

**Background:** SCENaTCS is an accepted treatment option for giant pituitary tumors.

**Methods:** Since 2014, we have used SCENaTCS for various large/invasive skull base tumors, including giant pituitary tumors. We classified these combined surgeries into four types on the anatomical basis. We analyzed the surgical results, postoperative complications, and outcomes with SCENaTCS to clarify the surgical advantages and technical pitfalls.

**Results:** Twenty-three consecutive SCENaTCS procedures for 21 patients with various large skull base tumors, including 11 giant pituitary neuroendocrine tumors, were classified as follows: Type 1 surgeries (n = 8): giant pituitary tumors with a marked suprasellar component; Type 2 surgeries (n = 8): midline parasellar tumors extending laterally beyond the lateral limit of the internal carotid artery; Type 3 surgeries (n = 4): giant tumors arising from the infratemporal fossa and/or the pterygopalatine fossa, with extension toward both intracranial and paranasal spaces; and Type 4 surgeries (n = 3): large invasive clival tumors compressing the brainstem posteriorly. Although two cases of postoperative cerebrospinal fluid leakage occurred, all surgeries were performed without major complications, including intracranial infections. The Karnofsky performance status score improved or remained stable in 21 of the 23 surgeries compared with preoperative scores (mean: 78.7 ± 19.4) and postoperative scores 6 months after surgery (mean: 86.5 ± 12.0).

**Conclusions:** SCENaTCS was safe and effective, with favorable results in the treatment of various complicated skull base tumors by intraoperative cooperation and communication between both surgeons. Operating room set-ups that avoid interference between the surgeons is important to ensure comfortable surgical environments.

## Trauma

Oral presentation

Predictors of post-operative hydrocephalus and subdural hygroma following decompressive craniectomy and its treatment modalities. Literature review and our experience

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**Objectives:** To investigate and predict the post-operative hydrocephalus and subdural hygroma collection following decompressive craniectomy and their treatment modalities.

**Background:** .

**Methods:** A retrospective study of emergency operated cases over a 8 year period who were admitted at Golden Hospital Biratnagar between April 2014 and September 2022 was performed. Post-operative hydrocephalus and subdural hygroma and their treatment modalities of 307 patients with traumatic brain injury following trauma who underwent decompressive craniectomy unilateral or bilateral at same period, were reviewed and monitored their clinical outcome. Our study also evaluated the effectiveness of moderately tight bandaging on post-op hydrocephalus and hygroma following DC.

**Results:** Postoperative hydrocephalus was identified in 82 patients (26.71%). Hydrocephalus was associated with large bone flap diameter, bilateral craniectomy, intraventricular hemorrhage, contralateral or interhemispheric subdural hygroma, and delayed cranioplasty. However, practically large craniectomy area, contralateral subdural hygroma and intraventricular hemorrhage were associated with hydrocephalus that needed further surgical intervention. The other risk factors that we observed were; very early decompressive surgery, distance from the midline to the craniectomy margin, post-operative meningitis etc. Most of the time the clinically significant hydrocephalus needed only temporary CSF diversion by lumbar drainage or external ventricular drainage followed by cranioplasty, however VP shunt was needed in five patients. The incidence of subdural hygroma and hydrocephalus was found lower after we started applying the moderately tight bandage rather than keeping it lax.

**Conclusions:** Hydrocephalus is a significant morbidity following DC. It is associated with large craniectomy area, contralateral subdural hygroma and intraventricular hemorrhage. VP shunt is required only in those patients who were refractory to temporary CSF diversion methods. Careful monitoring for the potential progression into hydrocephalus is needed clinically. Moderate pressure compression with crepe bandage has good results in reducing the incidence of post-operative hydrocephalus and hygroma. Early cranioplasty reduces the risk of development of hydrocephalus and hygroma.

## Spine

Oral presentation

Comparison of pedicle screw placement using navigation based C-arm & conventional C-arm guided techniques in thoracolumbar spine: prospective observational study

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**Objectives:** To study safety of pedicle screw placement with neuronavigation based C arm with traditional placement of pedicle screws with C-arm alone.

1. Accuracy
2. Radiation exposure
3. Time taken for placement.
4. Complications
5. Surgeon's confidence

**Background:** Recent advances in spine surgery have led continuous development of new implantation devices, visualization systems and more recently, navigation system. Navigation system allow surgeons to access volumetric, functional, and trajectory-based navigational data with real-time image guidance, ultimately resulting in better surgical outcome.

**Methods:** A hospital based prospective observational study was undertaken among the adult patients presenting to the Neurosurgery Department of Apollo Hospital, Bannerghatta road, Bengaluru. All the patients presenting with degenerative spine disorders, traumatic instability & spinal infections that require fusion procedure were considered for the study and divided into 2 groups

Group A - neuronavigation guided

Group B - conventional C-arm guided.

These 2 groups were compared for the following parameters (a) Time taken for pedicle screw placement, (b) Radiation exposure, (c) Accuracy and misplacement of screws and (d) Surgeon's confidence in placing the screws.

**Results:** A total of 200 pedicle screws were placed. 95% of the pedicle screws in the navigation group were accurately placed within the pedicle compared with 85% in C-Arm group. One patient required revision for neurological impingement in the navigated group which was later converted to C-arm. Mean confidence score of surgeon's using navigation guided was 31.1 to that of conventional based C-arm 28.6.

**Conclusions:** Pedicle screws are currently placed in the thoracolumbar spine via three main techniques: freehand, fluoroscopy guidance, and stereotactic navigation. Navigation assisted techniques provide benefit cannulating vertebrae with altered morphology. From this study, it can be inferred that with the safety and accuracy of the surgical navigation system with decrease in operating time, it appeared to be ideal.

## Global Neurosurgery

ePoster presentation

Reverse duroplasty – a new technique to reduce recurrence after surgery of chronic/subdural hematomas

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**Objectives:** Chronic/Subacute Subdural Hematoma (CSSDH) is a fairly common occurrence seen in the neurosurgery department. It may be post traumatic or secondary to any systemic etiology. Our study comprises of the comparison between the rates of recurrence of subdural hematoma post evacuation with conventional duroplasty and post craniotomy evacuation with reverse duroplasty.

**Background:** Incidence of CSSDH is 5/100,000/year in the general population, is higher for those aged 70 years and older 58/100,000. There lies a lack of uniformity in treatment as they present with wide spectrum of clinical presentations ranging from clinically overt to minimal neurological signs and symptoms. The most widely practiced and the standard treatment for CSSDH is surgical evacuation which may vary from a simple burr hole evacuation or craniotomy with reported recurrence rate ranges from 9.2% to 26.5%.

**Methods:** Retrospective descriptive cohort study comparing two surgical methods of duroplasty. A preoperative evaluation comprised of detailed history taking to evaluate the underlying cause, non contrast computed tomography (NCCT) Brain, and blood laboratory values. Patients who underwent the conventional technique of conventional duroplasty were placed in Group I whereas the patients who underwent reverse duroplasty in Group II. In follow up, NCCT brain done on post operative day 3, 14, 30, 90 and 180. Cut off date of 180 days being the end point of our study.

**Results:** The results show slightly higher rates of recurrence in males as compared to those in females and in patients who were on antiplatelets and anticoagulants or have a coagulopathy. Our study revealed that reverse duroplasty has significantly lower rate of recurrence.

**Conclusions:** There was significant reduction in rate of recurrence in CSDH among the patients who underwent reverse duroplasty instead of conventional duroplasty with significant statistical significance. There's no variation in the morbidity and mortality but is mere a modification in the technique of duroplasty.

## Spine

Oral presentation

### Patient selection and outcomes of standalone lateral interbody fusion: our experience and a systematic review

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**Objectives:** To synthesize factors correlated with successful and unsuccessful outcomes of stand-alone lateral interbody fusion (SA-LIF), both in our cohort and in a systematic review of literature.

**Background:** Standalone lateral interbody fusion has several benefits over posterior instrumented fusion. Optimizing patient selection for standalone is critical for successful outcomes. However, the indications for standalone compared with supplemented posterior pedicle screws or lateral plating has not been clearly delineated in the literature.

**Methods:** Three-fold: 12-year retrospective review of prospectively collected data from a single-neurosurgeon; long-term outcomes survey; systematic review of patient selection factors.

**Results:** Our experience: 1235 MIS (minimally invasive) fusion/instrumentation, 575 MIS-TLIF, 388 MIS-DLIF, 62 standalone-DLIF(97 levels), 4/62 failure group; statistical significance for failure with length-of-stay in high-care (p=0.0341), hypertension (p=0.0491) and younger age (46±10.3 years, p=0.0021). Long-term outcomes survey: mean follow-up 56.40 months, VAS pain score reduction (post-operative 78%, follow-up 68%). Outcomes for our cohort/systematic review: mean VAS improvement 68%/59%, subsidence 45%/55%, fusion 95%/88%, re-operation 3%/11%, segmental lordosis change 1.9°/3°, global lordosis change 6°/3°, disk height improvement 5%/11%, complication 13%/21%. Patient selection factors: History: elderly age, multiple comorbidities, no osteoporosis/active infection/malignancy/autoimmune disease/prior retroperitoneal surgery; Examination: positional improvement of radiculopathy, mild to moderate neurogenic claudication and no obesity/sarcopenia; Imaging: no significant sagittal/coronal imbalance, no overt dynamic spondylolisthesis, no spinal deformity requiring treatment, mild-moderate foraminal/lateral recess stenosis, mild central canal stenosis, facet arthropathy grade ≤2, Modic type 2, flat superior end-plate, <50% fat infiltration of multifidus, multifidus:vertebral body CSA ratio >0.6, no isthmic lysis/high-risk anatomy/calcified disc/synovial cyst/significant facet osteophyte; Indications: spondylolisthesis Meyerding grade ≤1, adjacent segment disease, ≤2 levels, no trauma; Peri-operatively: avoid opioids, preserve end-plate integrity, avoid over-distraction, use wider cages (≥22mm) with smaller heights, pass the walking test.

**Conclusions:** With proper patient selection, good operative technique and peri-operative management, standalone-LIF can be a safe and effective technique.

## Epilepsy

Oral presentation

### Underutilization of epilepsy surgery in Pakistan: ten-year experience from the only Comprehensive Epilepsy Center in the country

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**Objectives:** We aimed to study seizure control in all Epilepsy Surgery (ES) cases performed at the only comprehensive epilepsy center in the country during last ten years.

**Background:** Eighty percent of the global epilepsy burden is borne by developing countries, and 30% of these patients have drug-resistant epilepsy (DRE). ES can significantly improve the cognition and quality of life in DRE. A comprehensive epilepsy center was established in Pakistan in 2010, the only facility for ES in a country of 231 million people. Hundreds of epilepsy patients are medically managed at the center each year.

**Methods:** It was a retrospective cohort study. Medical records of all cases of ES performed at our center from 2012 to 2021 were retrieved, through the Hospital's Information Management System. Patients were also contacted via phone calls where needed, to collect information about their seizure control as per Engel Classification. Data was analyzed using SPSSv21.

**Results:** Thirty-three surgeries including 10 temporal lobectomies with amygdalohippocampectomy, 11 selective amygdalohippocampectomies, 9 corpus callosotomies, 1 callosotomy with lesionectomy, 1 lesionectomy and 1 temporal lobectomy were performed. The median age of patients was 23 (IQR: 18 – 31) years. Complex partial seizures were most common (14; 42.4%), followed by generalized seizures (10; 30.3%). The median duration of AEDs before surgery was 6 (IQR: 3.25 – 13.75) years. Eighteen (54.5%) patients had complete freedom from disabling seizures (Engel Class IA) at a median follow-up of 3.25 (IQR: 1.12 – 6) years. All patients continued to receive antiepileptic drugs after surgery, and all procedures had nearly 50% optimum seizure control outcomes.

**Conclusions:** The clinical outcomes of ES performed at our center are consistent with evidence. However, the small volume highlights the underutilization of this extremely important service. More studies are needed to identify the factors responsible for this disparity, so that all DRE patients have access to ES.



## Epilepsy

ePoster presentation

### National survey of knowledge and practice of neurologists about epilepsy surgery

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**Objectives:** We aimed to assess the existing knowledge and practices of neurologists in Pakistan about Epilepsy Surgery (ES) to identify gaps in awareness.

**Background:** The efficacy and safety of ES for refractory epilepsy is well-established. However, despite carrying 1/10th of the global epilepsy burden in Pakistan (approximately 2 million patients), epilepsy surgery is almost non-existent in the world's fifth most populous country. Apart from the extremely small number of trained epilepsy surgeons, an important factor can be lack of knowledge among neurologists who are the predominant care-givers for epilepsy patients.

**Methods:** It was a cross-sectional study. The questionnaire was sent via email and text messages to all the adult and pediatric neurologists in the country via Pakistan Society of Neurology. The response rate was 31.6% (56/177 neurologists). The results were analyzed using SPSSv21.

**Results:** Thirty-four neurologists (60.7%) were aware of the correct criteria for medically refractory epilepsy (MRE). Half of the respondents (28; 50%) believed that MRE patients with generalized seizures would not benefit from ES. Twenty neurologists (35.7%) thought that mental retardation was a contraindication to ES. While most neurologist agreed that ES is underutilized in the country (54; 96.4%), and concurred with the need for establishing comprehensive epilepsy treatment centers in the country, only 6 (10.8%) mentioned that they routinely discuss the option of ES with their MRE patients. Seventeen (30.4%) thought that ES has a very low rate of meaningful seizure control. Most of the neurologists were locally board certified (44; 78.6%), followed by US Board certification 6 (10.7%).

**Conclusions:** Most neurologists in Pakistan understand the need for improving access to ES, however, they rarely take the surgeon onboard for MRE. The important knowledge gaps identified through our results maybe a reason, in addition to the lack of availability of trained epilepsy surgeons.

## Global Neurosurgery

Oral presentation

Using unsupervised segmentation technique to develop a Surgeon-machine Interface for intraoperative neurosurgical guidance

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**Objectives:** · Qualitatively assess the use of Segment Anything Model (SAM) for unsupervised segmentation in spinal dural arteriovenous fistula (dAVF) video via prompt engineering.  
· Quantitatively assess the mIOU of the SAM for unsupervised segmentation prompted by the trained ADAPTIS network.

**Background:** The Surgeon-Machine Interface (SMI) merges surgeons and artificial intelligence to offer real-time intraoperative surgical guidance via identification, analysis, and feedback. Anatomical guidance and further surgical decision support have the potential to standardise neurosurgical care and enhance training opportunities in low-resource settings. However, current computer vision (CV) techniques for identifying surgical landmarks are constrained to semantic and bounding box-based instance segmentation, necessitating alternative approaches to reduce annotation requirements and enhance precision. We report a new CV framework for SMI, employing unsupervised video segmentation to identify landmarks within a single neurosurgical video dataset.

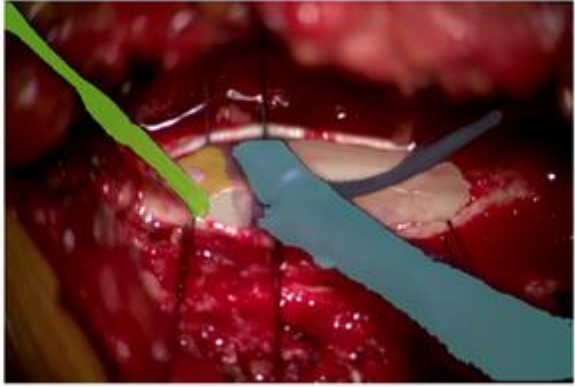
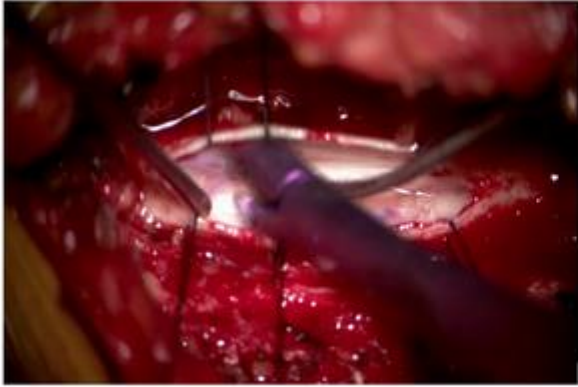
**Methods:** We developed a custom deep learning neural network using semantic video segmentation on a single test video of an open spinal dural arteriovenous fistula (dAVF) recorded with Zeiss Opmi Pentero 800. The Segment Anything Model (SAM; Meta Platforms Inc., California, United States) performed unsupervised semantic video segmentation on the surgical video. Masks were validated by zero-shot prompting by the ADAPTIS network, which was trained with annotations based on 132 frames. mIOU was calculated to assess and validate the accuracy of our unsupervised semantic video segmentation model.

**Results:**

The fine-tuned SAM architecture successfully differentiated anatomical structures with surgical tools via prompt engineering with pre-trained ADAPTIS network (Figure 1). mIOU calculated over 264 frames was 65.16.

**Conclusions:**

We validated the use of an unsupervised semantic video segmentation technique in an open spinal dural arteriovenous fistula (dAVF) surgery. Adding tracking algorithms will improve current accuracy. Developments on this framework should further aim to perform instance video segmentation and continue fortifying this data-light training approach to assist in low resource training and automated intraoperative guidance.



## Functional

Oral presentation

Directly identifying and precisely lesioning the cerebellothalamic tract at the thalamic base for tremors: a prospective open-label study

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**Objectives:** By using magnetic resonance (MR) imaging directly to anatomically localize the tremor target for treatment.

**Background:** Targeting the ventralis intermediate nucleus (Vim) for tremors is well established, but sometimes accompanied by some extent adverse effects due to the fact that the vim is a functional area and unable to be discriminated on MR imaging. However, the cerebellothalamic tract (ctt) can be distinguished on MR imaging due to its myelinated and closely packed fibers converging into a dense bundle at the inferior aspect of the thalamus. Thus, the aiming to accurately localize and precisely lesion this cct site is believed to gain more satisfying outcome for the treatment of tremor.

**Methods:** 57 patients with tremors were enrolled in this study, obtaining the specific 3T MR images to visualize the target, fusing MR image with stereotactic CT image, refining the target coordinates according to individual tremor pattern and affected body parts, lesioning the target under macrostimulation. The tremors relief, complications, and patients satisfaction were evaluated and followed up.

**Results:** 79 procedures were performed in 57 patients, including 17 Parkinson's disease patients and 5 essential tremor patients with staged bilateral lesions. On MR imaging the cct was delineated as a low-signal area where was at 2 to 4 mm posterior to the midcommissural point, 10.5 to 15mm lateral to the midline, and 1mm below to 1mm above the AC-PC plane. The lesioning zone precisely covered the targeting site on postoperative MR images. The contralateral tremors disappeared totally, no adverse effects and complaints were found in all patients but one with a transient dysarthria, the satisfying results kept stable with 6 to 72 months follow-up.

**Conclusions:** The cct was visible on MR imaging; precisely lesioning the cct spot for tremors produced excellent results with fewer adverse effects; the staged bilaterally lesioning cct was feasible.

## Global Neurosurgery

Oral presentation

Integrating military and civilian resources to improve global neurosurgical care

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**Objectives:** 1. Inform the audience about the complementary aspects of military and civilian neurosurgical care.  
2. Describe the benefits of globally integrating military and civilian neurosurgical care.

**Background:** The need for more neurosurgical care globally is well documented. In most countries military medical resources are better developed than the public civilian resources – yet the military resources are frequently underutilized despite the obvious need. Over the past several decades in the USA, for example, there have been efforts to integrate civilian and military medical resources – primarily to improve trauma care nationwide.

**Methods:** The most extensive roadmap for integration in the USA is the 2016 publication “A National Trauma Care System: Integrating Military and Civilian Trauma Systems to Achieve Zero Preventable Deaths After Injury”. Other countries have pursued different paths to integrate military and civilian care, typically to improve overall healthcare as well as to optimize training of military neurosurgeons during periods without ongoing combat.

**Results:** In the USA, military neurosurgeons (both staff and in-training) have recently begun integrating into the civilian trauma centers – as faculty and residents working side-by-side with civilian counterparts. Chile has a Ministry of Emergency Response that provides immediate military support for medical emergencies that exceed civilian resources. Israel has pioneered seamless integration of military and civilian medical resources, including neurosurgery; the Israeli Defense Forces Field Hospital was the first to receive WHO Type 3 certification (the highest level).

**Conclusions:** There are multiple advantages of integrating military and civilian medical resources:

1. Day-to-day healthcare, including neurosurgical care, is improved by more efficient utilization of resources.
2. Military resources for mass casualty emergencies are readily available to augment the civilian healthcare response.
3. Military neurosurgeons – both in-training and staff – achieve and maintain clinical skills during periods when combat experience is not available.

## Oncology

ePoster presentation

### Single-stage combined approach for radical in-bloc resection of thoracic spinal thymoma metastases: presentation of a rare disease

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**Objectives:** To present the single-stage combined approach (posterior spinal, thoracic and retroperitoneal) as a safe, feasible option for in bloc radical resection of metastatic lesions of thymic tumors.

**Background:** Thymoma is rare primary mediastinal tumor with an estimated incidence of 1,7 per 1.000.000/year in Europe. Histological classification defines vital prognosis. Metastatic disease is rare, being more common in thymic carcinoma to liver and lymph nodes. Spinal affection(SA) is an exotic location for metastases. Radical surgical treatment influences quality of life(QOL) (pain control, spinal harmony maintenance),overall and progression-free survival.

**Methods:** 47-years-old male patient, with a prior B3 stage Thymoma disease (pleural and phrenic nerve invasion) treated with radical surgery and chemo-therapy. Presents with high-intensity dorsal and costal pain after 14 years of follow-up. Evidencing in MRI extensive metastatic lesion in T-10 vertebral body invading spinal canal secondary to voluminous pleural and rib mass.

**Results:** The patient underwent partial T-9 and T-11, T-10 laminectomy with complete epidural and foraminal mass resection. In the same surgical-time, pleural and retroperitoneal radical in-bloc tumoral resection through costo-trasversectomy and partial T-10 corpectomy was performed, as well as, bilateral T9-T11 and right T-10 pedicular screws. The patient did not present intra-operative or admittance-related complications. He presented complete resolution of pain and was discharged after 5 days. Pathology analysis confirmed complete tumoral resection with the presence of disease-free borders in the analyzed stains.

**Conclusions:** It is possible to perform combined radical surgery for SA of thymic tumors in a safe and effective way, giving a positive impact in QOL, as well as, a potential benefit in overall and progression-free survival.

Maintenance or restoration of spinal harmony is a fundamental factor that contributes to the care of neurological function and the QOL of the patient.

Careful selection of the appropriate case is crucial to decrease the morbidity associated with the surgical procedure.

## Oncology

ePoster presentation

Tumors of the central nervous system; unicentric statistical report in Mexico 2016-2022

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### **Objectives:**

To know the prevalence of CNS Tumors, reported in our medical unit, providing a database to collaborate for future multicenter studies in our country.

Material and **Methods:** Retrospective and single-center study.

### **Background:**

Tumors of the Central Nervous System (CNS) are the object of study of great interest due to the repercussions for both the patient and the family due to their high rate of sequelae, mortality, economic impact, as well as their impact on the National Health System. given its increase in frequency, the high cost of treating these patients, as well as the affectation of economically active patients, particularly one of the phenomena seen in recent decades is the increase in its incidence in increasingly younger patients with the consequent socio-economic repercussion that this will represent.

**Methods:** Capturing 924 patients who were treated by the Neurosurgery service in the period between January 2016 and December 2022. Only 680 patients met the inclusion criteria, performing manual data extraction from the clinical record.

### **Results:**

Inversion of the frequency in Pituitary Adenomas and Meningioma, as well as a significant decrease of almost a decade in the maximum incidence in the age of diagnosis of Glioblastoma.

### **Conclusions:**

Certain similarities and differences are observed according to the statistics reported in the literature, however it is necessary to expand to other health sectors in order to obtain more statistically significant conclusions. The inversion in the frequency of Meningiomas and Pituitary Adenomas, and de location frequency of those meningiomas are inverted from parasagittal location to convexity location, as well as the decrease in the age (one decade) of the highest incidence of Glioblastoma are findings that must continue to be investigated due to their great impact on public health.

## Spine

Oral presentation

### Outcomes of the SpineJack® vertebral augmentation system in the management of traumatic thoracolumbar fractures in a UK population

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#### Objectives:

1. To assess the clinical outcomes following SpineJack® vertebral augmentation outcomes in patients with traumatic thoracolumbar fractures.
2. To evaluate the length of post-operative stay and complications.

**Background:** Thoracolumbar fractures are common, with an annual incidence of 30/100,000. They may be managed conservatively or operatively depending on presence of neurological deficit, pain or stability. SpineJack® is a vertebral augmentation system licensed in Europe for the reduction of mobile spinal fractures from osteoporosis, trauma or malignancy. Outcomes from a UK population following this procedure are unknown.

**Methods:** We conducted a single-centre, retrospective case-control study covering a period from 11th May 2021 to 16th February 2023. Patients >16 years old presenting with traumatic AOSpine A2-A4 thoracolumbar fractures without neurological deficit within 6 weeks of injury managed with SpineJack® were included. Using the electronic healthcare record and British Spine Registry (BSR), patient demographics, level(s) of fracture, vertebral compression angle (VCA - a measure of the degree of kyphosis) pre- and post-operatively and length of hospital stay was collected. Patient Specific Activity Scale (PSAS) was recorded from the BSR.

**Results:** 20 patients were included in this study (11 male, mean age 42.3 years). Patients were operated on a median 5 days following injury. 17 (85%) patients had single-level fractures, most commonly at L1 (40%), with 23 vertebral fractures overall. 6 patients had significant comorbidities (3 cardiovascular, 2 respiratory). Patients had a mean 54% correction in the VCA. One patient required subsequent thoracolumbar fixation due to suboptimal VCA correction. There were no significant postoperative complications and the median length of hospital stay post-operatively was 6 days. Mean PSAS function and expectation score 6-week post-operatively was 19.6/30 and 25.6/30 respectively (6 patients), increasing to 28.75/30 and 30/30 respectively at 6 months (4 patients).

**Conclusions:** SpineJack® is a safe and effective procedure for the management of A2-A4 traumatic thoracolumbar fractures.



## Trauma

Oral presentation

The incidence and anatomical location of magnetic resonance T2 white matter hyperintensities in patients presenting to a specialist sports concussion clinic

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**Objectives:** 1. To determine the incidence of MRI T2 white matter hyperintensities (WMH) in patients undergoing multimodal MRI head following sports concussion.

2. To determine the anatomical locations of WMH.

**Background:** Sports-related concussion (SRC) is a subset of traumatic brain injury (TBI), typically resulting in rapid-onset, short-lived impairment of neurological function that resolves spontaneously'. Although the acute management of head injury in sports follows standard management pathways, there is an increasing recognition of the chronic sequelae of SRC, such as chronic traumatic encephalopathy. T2 White matter hyperintensities (WMH) on MRI have been positively associated with TBI in the literature, although their role in SRC has not been explored, particularly in a UK population. In this study, we investigated the incidence of WMH and associated clinical outcomes in an athlete population at our centre.

**Methods:** All patients >13 years old referred to the Birmingham Sports Concussion Clinic who underwent multimodal concussion protocol MRI between 2015-2023 as part of their clinical evaluation were prospectively entered into a database. MRI reporting was done by a single radiologist, and all patients with reported T2 WMH were further analysed; data was collected on sport, total estimated number of concussions by time of scan and anatomical location of T2 WMH.

**Results:** Of 432 patients undergoing MRI scanning, 95 (22%, 78 male, mean age 24.4) had T2 WMH. In this cohort, most patients played rugby (62%) with a median 2 concussions prior to first MRI. 72% of patients with >1 T2 WMH were rugby players. The most common anatomical locations were in the frontal (71%) and subcortical (58%) regions.

**Conclusions:** We present the largest UK cohort of T2 WMH in an SRC population. The correlation between the extent and anatomical location of WMH and clinical symptoms, particularly return to play, are yet to be determined and will be explored in future studies.

## Spine

Oral presentation

### Sagittal balance parameters in achondroplasia

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**Objectives:** Evaluating the correlation of sagittal balance parameters in Achondroplast patients.

**Background:** Achondroplasia (Ach) is a type of skeletal dysplasia in which the abnormal anatomy of vertebra affects the spinal curvature and sagittal (im)balance of the spine. This is hypothesized to play a role in compression of neural structures and lead to clinical symptoms. A first step in understanding pathophysiology is evaluating the correlation of the balance parameters.

**Methods:** Ach patients visiting our clinic between 2019 to 2022 were evaluated. Sagittal imbalance is defined as an increased C7 sagittal vertical axis (SVA) (>10 mm). Pairwise Pearson correlation analysis was applied to explore the association between the following parameters: lumbar lordosis (LL), thoracolumbar kyphosis (TLK), C7 sagittal vertical axis (SVA), pelvic incidence (PI), sacral slope (SS), and pelvic tilt (PT).

**Results:** A total of 28 Ach patients were included; 13 patients demonstrated sagittal imbalance. SS was comparable in imbalanced and balanced patients (45.0° and 49.0°,  $p = 0.305$ ), but exceeding the mean SS in non-achondroplasts (38.0°). LL was more pronounced in the balanced group (55.5° versus 41.7°,  $p = 0.019$ ), and positively correlated to SS. TLK was increased comparably in both groups (19.6° and 24.6°), and far exceeding the TLangle in non-achondroplasts (circa 0°), and in both groups negatively correlated with the LL. Like the SS, PT was comparable in both groups (18.9° and 22.9°,  $p = 0.645$ ), exceeding PT in non-achondroplasts (15°).

**Conclusions:** In achondroplasia, SS and TLK are larger compared to non-achondroplasts. Only if LL compensates for both a larger SS and TLK, the Ach spine can maintain sagittal balance. An explanation for the current data in adults can be the failure of the lumbar spine to give sufficient lordosis due to degenerative processes. It would be interesting to evaluate these sagittal balance compensatory mechanisms in young achondroplasts.

## Spine

Oral presentation

### Cervical deformity and flare-ups in disease activity in rheumatoid arthritis

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**Objectives:** The aim of the current study is to evaluate the correlation of the frequency of flare-ups in DAS to cervical spine deformity.

**Background:** Following the introduction of biological DMARDs in Rheumatoid Arthritis (RA) treatment, cervical spine deformity seems to be less prevalent in practice. In a previous study, average disease activity (DAS) over a 10-year follow-up period did not demonstrate a correlation to the occurrence of Atlanto-axial Subluxation (AAS) or Subaxial Subluxation (SAS).

**Methods:** This study uses data of the BeSt Trial. Medication was stopped if sustained remission ( $DAS_{44} < 1.60$  for  $\geq 6$  months) was reached and restarted upon a flare-up ( $DAS_{44} > 1.60$  after reaching sustained remission). Odds Ratios were corrected for age at baseline, gender, ACPA-positivity and RF-positivity.

**Results:** 272 RA patients were included and mild cervical deformity (AAS and/or SAS  $> 2$  mm) was observed in 108 patients (40%). 26 patients had an atlantoaxial interval of 3 mm or more in flexed position and 8 had an atlantoaxial interval of 5 mm or more. A trend was observed that the odds of developing cervical spine deformity were lower for patients with more flare-ups. The OR of cervical spine deformity after 10 years was 0.338 for patients with 3 or more flare-ups (95% CI: 0.095-1.20;  $p = 0.095$ ). There was no significant difference in the total duration of flare-ups in the patients with and without cervical spine deformity (OR 1.008; 95% CI 0.989-1.027).

**Conclusions:** Remarkably, odds for mild deformity trended to be lower for patients with less flare-ups. This may be explained by the treatment regimen that medication was augmented upon measuring a systemic flare-up. This raises the hypothesis that RA-medication treatment regimens should not be solely aimed at DAS values, as they are currently defined, in order to avoid cervical deformity in RA in the long term.

## Spine

Oral presentation

### Augmented reality versus freehand spinopelvic fixation in spinal deformity - a case-control study

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**Objectives:** To compare screw placement accuracy and outcomes between freehand (FH) and AR-guided pelvic fixation.

**Background:** Augmented reality (AR) enables real time integration of radiographic images with the operative field. While pelvic fixation is a critical technique in spinal deformity surgery, S2AI screw placement poses unique challenges.

**Methods:** We conducted a case-control study of 50 consecutive patients who underwent spinopelvic fixation. AR guidance was performed using a head mounted display (Xvision, Augmedics). Screw accuracy was assessed by a blinded neuroradiologist using a validated breach grading scale.

**Results:** Pelvic fixation was performed FH in 21 patients (median age, 64; female, 38.1%; median BMI 32.3 kg/m<sup>2</sup>) and with AR-guidance in 29 patients (median age, 66; female, 51.7%; median BMI 28.4 kg/m<sup>2</sup>). Smoking (FH, 61.9%; AR, 55.2%), osteoporosis (FH, 23.8%; AR, 20.7%), and prior thoracolumbar surgery (FH, 61.9%; AR, 62.1%) rates were comparable. Mean follow-up was longer in the FH than AR group (28 mos vs. 11 mos,  $P < 0.001$ ).

Average number of instrumented levels was 7.8 (FH) and 8.0 (AR). Pelvic fixation in the FH group was either S2AI (90.5%) or dual S2AI (9.5%). In the AR group, S2AI (82.7%), dual S2AI (10.3%), or other pelvic fixation (7.0%) was utilized. There were no significant differences in length of surgery (FH, 439 minutes; AR, 490 minutes;  $P = 0.1$ ) or estimated blood loss (FH, 2.1L; AR, 1.9L;  $P = 0.7$ ). FH pelvic fixation accuracy was 95.6% (43/45 screws) and AR pelvic fixation accuracy was 96.6% (56/58 screws). Multivariable logistic regression for screw breach revealed no significant association with AR guidance, controlling for age, BMI, osteoporosis, and smoking.

**Conclusions:** We present the first case-control study of AR-guided spinopelvic fixation. Our findings suggest parity between FH and AR-guidance and provides a foundation for prospective controlled studies with longitudinal follow up to interrogate the benefits of AR-guidance in spinal deformity surgery.

## Global Neurosurgery

Oral presentation

Quantifying delays in presentation after traumatic spinal cord injury - a systematic review

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**Objectives:** To systematically review existing studies investigating delays in presentation after TSCI in low- and middle-income countries (LMICs) and high-income countries (HICs).

**Background:** Prompt surgical decompression after traumatic spinal cord injury (TSCI) may be associated with improved sensorimotor outcomes. Delays in presentation may prevent timely decompression after TSCI.

**Methods:** A systematic review was conducted and studies featuring quantitative or qualitative data on prehospital delays in TSCI presentation were included. Studies lacking quantitative or qualitative data on prehospital delays in TSCI presentation, case reports or series with <5 patients, review articles, or animal studies were excluded from our analysis.

**Results:** After exclusion criteria were applied, 24 studies were retained, most of which were retrospective. Eleven studies were from LMICs and 13 were from HICs. Patients with TSCI in LMICs were younger than those in HICs, and most patients were male in both groups. A greater proportion of patients with TSCI in studies from LMICs presented >24 hours after injury (HIC average proportion, 12.0%; LMIC average proportion, 49.9%;  $P = 0.01$ ). Financial barriers, lack of patient awareness and education, and prehospital transportation barriers were more often cited as reasons for delays in LMICs than in HICs, with prehospital transportation barriers cited as a reason for delay by every LMIC study included in this review.

**Conclusions:** Disparities in prehospital infrastructure between HICs and LMICs subject more patients in LMICs to increased delays in presentation to care. Given the importance of urgent intervention in TSCI, this requires greater scrutiny.

## Spine

Oral presentation

### Marked increase in minimally invasive sacroiliac joint fusion utilization by non spine surgeon specialists

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**Objectives:** To describe trends in SI joint fusions performed by different provider groups, along with the charges billed and reimbursement provided by Medicare.

**Background:** Sacroiliac (SI) joint dysfunction constitutes a leading cause of axial pain and disability, and patients with refractory pain may benefit from surgical arthrodesis. Although traditionally performed under open approaches, the past decade has seen a rise in minimally invasive surgical (MIS) techniques and new federally approved devices for MIS approaches. Little is known about the adoption of these MIS techniques and which specialists are performing them.

**Methods:** Retrospective cohort study using data from the Centers for Medicare and Medicaid Services' Physician/Supplier Procedure Summary yearly data sets from 2015 to 2020. Utilization was adjusted per million Medicare beneficiaries and weighted averages for charges and reimbursements were calculated, controlling for inflation. Reimbursement-to-charge (RCR) ratios were calculated, reflecting the proportion of provider billed amounts reimbursed by Medicare.

**Results:** A total of 12,978 SI joint fusion procedures were performed, with the majority (76.5%) being MIS procedures. Most MIS procedures were performed by non-surgical specialists (52.1%), while most open fusions were performed by spine surgeons (71%). Rapid growth in MIS procedures was noted for non-surgeon specialists, along with an increased number of procedures offered in the outpatient setting and ambulatory surgical centers. The overall RCR increased over the study period and was ultimately similar between spine surgeons (RCR=0.26) and non-surgeon specialists (RCR=0.27) performing MIS procedures.

**Conclusions:** Substantial growth in the number of MIS procedures performed for SI pathology has occurred over the past decade in the Medicare population. This growth can largely be attributed to adoption by non-surgical specialists, whose reimbursement and RCR increased for MIS procedures. Future studies are warranted to better understand the impact of these trends on patient outcomes and healthcare costs.

## Spine

ePoster presentation

### Predicting failure of medical management in spinal epidural abscess: external validation of current predictive models

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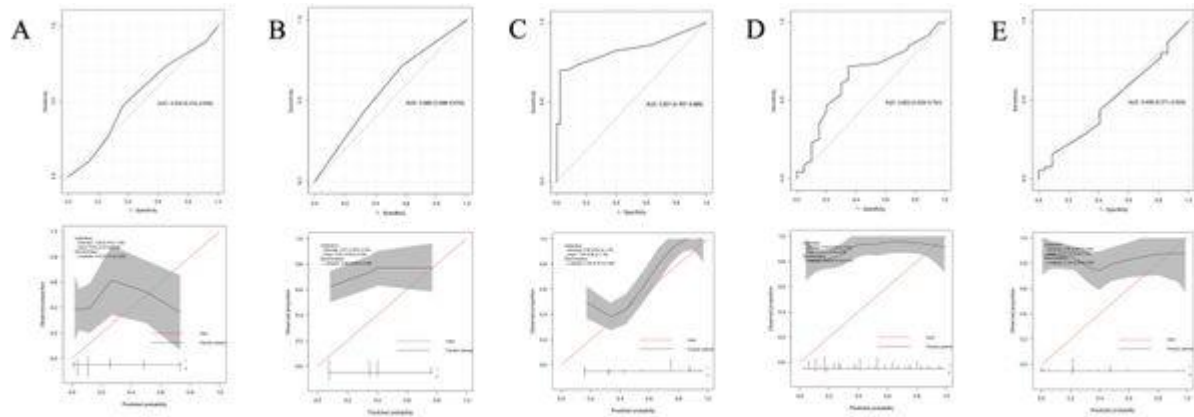
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**Objectives:** To evaluate the external validity of five predictive models in an independent cohort of patients with spinal epidural abscesses (SEA).

**Background:** There is little consensus regarding management of spinal epidural abscesses (SEA), especially in patients without neurological deficits. Several models based on institutional populations have been created to predict failure of medical management in patients with SEA.

**Methods:** The records of 176 patients treated for SEA between 2010 and 2019 at our institution were reviewed, and variables relevant to each predictive model were collected. Published SEA score algorithms (N=5) were used to assign probability of medical management failure to each patient. Predicted probabilities of medical failure and actual patient outcomes were used to create Receiver Operating Characteristic (ROC) curves, with the area under the ROC curve (AUROC) used to quantify a model's discriminative ability. Calibration curves were plotted based on predicted probabilities and actual outcomes. The Spiegelhalter Z-test was used to determine adequate model calibration.

**Results:** One model (Kim et al.) demonstrated good discriminative ability and adequate model calibration in our cohort (ROC = 0.831, z-test p-value = 0.83). Parameters included in the model were age > 65, diabetes, infection with MRSA, and neurological impairment. The four additional models did not perform well in terms of discrimination or calibration metrics (Page et al, ROC = 0.534, z test p-value = <0.0001; Patel et al, ROC = 0.580, z test p-value = <0.0001; Shah et al, ROC = 0.653, z test p-value = <0.0001; Baum et al, ROC = 0.498, z test p-value = <0.0001).



Area under the receiver operating characteristic curve and calibration Plot for the spinal epidural abscess predictive scores published by (a) Page et al. (b) Patel et al. (c) Kim et al. (d) Shah et al. and (e) Baum et al.

**Conclusions:** Only one published predictive model was validated in our cohort, suggesting limited generalizability of the evaluated models. Multi-institutional data may facilitate the development of widely applicable models to predict medical management failure in patients with SEA.



## Trauma

Oral presentation

### Reconstructive neurosurgery in rehabilitation of patients with posttraumatic disorders of consciousness

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**Objectives:** The aim of the study was to estimate the effects of shunting and cranioplasty in patients with hydrocephalus and cranial defects in areactive wakefulness and minimally consciousness state.

**Background:** With wide introduction of decompressive craniectomy in neurosurgical practice the number of severely disabled patients after severe traumatic brain injury (TBI) raised dramatically. However, rehabilitation and mental recovery depend greatly on normalization of cerebrospinal fluid circulation and brain perfusion.

**Methods:** In the Burdenko National Medical Research Center of Neurosurgery 210 patients were shunted for posttraumatic hydrocephalus between 1990 and 2022. Retrospective analysis revealed 39 patients in areactive wakefulness and minimally consciousness state with hydrocephalus and large cranial defects among them. These patients underwent treatment which included consecutive shunting and cranioplasty.

**Results:** Surgery resulted in significant mental recovery in 26 patients (66,7%), various infectious complications were encountered in 8 cases (20,5%), shunt malfunction in 3 cases (7,6%), hemorrhage in 1 case, 1 patient died. Either no effect of surgery on recovery or even decline was observed in 12 patients.

**Conclusions:** The results of treatment of severe TBI are still unsatisfying due to large number of severely disabled patients with posttraumatic hydrocephalus and defects. Based on our data more than half of these patients may improve and progress for further rehabilitation. Further research must be held to improve the results of surgeries, figure out predictors of positive outcome of surgery and lower the risks of potentially lethal complications.

## Skull Base

Oral presentation

A comparative study of microsurgery and gamma knife radiosurgery in vestibular schwannoma evaluating tumor control and functional outcome

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**Objectives:** This present study aimed to compare the nuances in treatment of vestibular schwannoma (VS) by microsurgical resection (*SURG*) and *Stereotactic Radiosurgery (SRS)* in two specialized neurosurgical centers.

**Background:** The level of evidence to provide treatment recommendations for VS is remarkably low. Both SRS and SURGERY are available as treatment options. However, there are very few large direct comparative studies comparing both treatment modalities in large cohorts allowing detailed subgroup analysis.

**Methods:** This is a retrospective bi-centric cohort study. Data was retrospectively collected from two large centers primarily involved in the treatment of VS for patients between 2005 und 2011. Tumor size was classified according to Koos Classification. Clinical condition was evaluated according to House-and-Brackmann and Gardner-Robertson scale (H&B1-2 and G&R1-2 as good outcome), and Recurrence-free-survival was assessed by contrast-enhanced MRI. Pre- and post-operative data on VS-associated symptoms like trigeminal affection, tinnitus, and vertigo/imbalance were collected.

**Results:** N=901 patients were included in this study with N=559 treated with *SRS*, and N=342 with *SURGERY*. Overall mean follow-up was 7 years. This study reported an overall incidence of recurrence in *SURGERY* of 4%, and 11% in *SRS*. This difference in tumor control was significant in the subgroups Koos III and IV ( $p=0.001$ ,  $p=0.027$ ). However, facial deterioration and hearing-loss were more pronounced in this subgroup. In small tumors (Koos I-II), tumor control was equivalent in *SRS* and *SURGERY*. In small tumors (Koos I-II), the qualitative results in terms of facial and hearing-preservation were similar in *SURGERY* and *SRS*.

**Conclusions:** *SRS* can achieve similar tumor control to *SURGERY* in smaller VS (Koos I and II) – with similar postinterventional morbidities. In Koos III-IV VS, *SRS* effect in tumor control is inferior to *SURGERY*. *SURGERY* may improve secondary VS-symptoms (tinnitus, vertigo/imbalance, trigeminal symptoms), more frequently than *SRS*. If combination therapy is chosen, the residual tumor should not exceed the size of Koos II.

## Trauma

Oral presentation

### Concomitant traumatic brain injury delays surgery in patients with traumatic spinal cord injury

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**Objectives:** To quantify the effects of TBI on delays to surgery and nonroutine discharge, defined as death or transfer to hospice/long-term care facilities, among a national cohort of patients with tSCI and CCS who underwent surgical intervention.

**Background:** Rates of concomitant traumatic spinal cord injury (tSCI) and traumatic brain injury (TBI) range from 10-30%. Growing evidence suggests prompt surgical decompression patients with tSCI and central cord syndrome (CCS). Concomitant TBI may delay diagnosis of tSCI and limit prompt intervention. Little is known about real-world management of this common injury constellation that has significant clinical consequences.

**Methods:** We utilized the National Trauma Data Bank (2007-2018) to identify patients presenting with non-penetrating tSCI who underwent surgical decompression. Patients without data on time to surgery and receipt of surgical intervention after 14 days were excluded. Multivariable logistic regression and linear regression models were constructed to quantify the effect of TBI on surgical timing.

**Results:** We identified 27,048 patients with tSCI, of whom 4,580 (16.9%) had concomitant TBI (male, 75%; mean age, 49.2, median ISS 17). Multivariable regression models revealed that TBI significantly increased the risk of delayed intervention in both tSCI (OR, 1.4; 95% CI, 1.3-1.5) and CCS (OR, 1.3; 95% CI, 1.2-1.5) cohorts. Furthermore, linear models showed that concomitant TBI delayed surgery by 8.4 and 11.7 hours in injury-matched tSCI and CCS patients, respectively ( $p < 0.001$ ). We found that delay in intervention translated into increased the risk of nonroutine discharge in tSCI (OR, 1.1; 95% CI, 1.03-1.1) and CCS (OR, 1.3; 95% CI, 1.1-1.3) patients.

**Conclusions:** Concomitant TBI delays surgical management of these patients and may increase the risk of nonroutine discharge. Prospective studies and dedicated protocols for polytrauma patients are required.

## Skull Base

Oral presentation

### Cystic Vestibular Schwannoma – a subgroup analysis from a comparative study between radiosurgery and microsurgery

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**Objectives:** This study aims to analyze the management of cVS compared to ncVS in a dual center study of surgically (SURG) and radiosurgically (SRS) treated VS patients.

**Background:** Some vestibular schwannoma (VS), show cystic morphology. It is known that these cystic vestibular schwannomas (cVS) bear different surgical risk profile compared to non-cystic VS (ncVS) in surgical treatment.

**Methods:** This is a retrospective multi-center cohort study. Data was retrospectively collected from two large centers involved in the treatment of VS. Tumor size was classified by Koos Classification. Clinical state was reported by House and Brackmann (H&B) and Gardner-Robertson (G&R) scale (H&B1-2 and G&R1-2 = good outcome), and Recurrence-free-survival (RFS) was assessed by contrast-enhanced MR imaging.

**Results:** The study population included N=901 patients. N=559 (62%) patients were treated by SRS, and N=342 (38%) patients by SURGERY. N=55 (6%) of all patients showed cystic MR-morphology. These were more often treated by SURG (58%) compared to ncVS (37%) (p=0.002). Patients with cVS were indifferent in mean age compared to ncVS. The rate of women was higher in cVS (64%), compared to ncVS (55%) (p=0.001). The overall incidence of recurrence was 16% in cVS (8% in ncVS). Tumor control was worse in cVS treated by SRS (25%) compared to SURGERY (9%). When surgically treated, gross total resection (GTR) was achieved in 87% in cVS, whereas this rate was higher in non-cystic VS at 96% (p=0.001). The number of patients N=5/32 (16%) with postoperative relevant facial palsy (HB>2) was significantly higher in cVS (ncVS: N=28/310; 9%).

**Conclusions:** Tumor control in cVS is significantly worse in SRS compared to SURG and SRS-treated ncVS. However, when cVS is treated surgically, the rate of GTR is lower and the number of patients with relevant postoperative facial palsy higher compared to ncVS. Cystic morphology in VS poses a challenge in management compared to solid tumors.

## Skull Base

Oral presentation

Sex-related differences in patients characteristics, and treatment outcome in a comparative study of microsurgery and radiosurgery of vestibular schwannoma

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**Objectives:** This study elucidates sex-related differences in Vestibular schwannoma care.

**Background:** Gender-related differences in patients with sporadic, unilateral vestibular schwannoma (VS) are poorly investigated so far. In studies focusing on natural history, tumor growth was described to be indifferent in either sex. However, it remains unclear whether patient's sex affects the treatment response to stereotactic radiosurgery (SRS) or microsurgical resection (SURGERY).

**Methods:** This is a retrospective multi-center cohort study. Data was retrospectively collected from two large centers. Tumor size was classified by Koos Classification. Clinical state was reported by House and Brackmann (H&B) and Gardner-Robertson (G&R) scale (H&B1-2 and G&R1-2=good outcome), and recurrence-free-survival was assessed by contrast-enhanced MR imaging. Data on trigeminal affection, tinnitus, and vertigo/imbalance were also collected.

**Results:** The study population included N=901 patients, who were treated in both centers. N=502 (56%) VS patients were female and N=399 (44%) were male. At time of treatment, women (56 years SD±13.50) were significantly older in age than men (53 years SD±13.80) (p=0.001). Tumor size, cystic morphology, intracanalicular extension, provided care (SRS, SURGERY), treatment related complications, and extent of surgical resection were insignificant in both gender-groups. The incidence of relevant preoperative vertigo was higher in women (67%) than in men (55%) (p=0.002). Pre- and postoperative facial function, hearing loss, and trigeminal symptoms were similar in both groups. Overall incidence of recurrence was insignificant (p=0.106). However, in subgroups, tumor control with SRS was significantly worse in women compared to men (p=0.035).

**Conclusions:** Provided Care, functional outcome and peri-interventional morbidity were the same in either sex. Relevant vertigo was significantly more often present in women. The incidence of recurrence is higher in women with VS, when treated with SRS compared to men, although tumor characteristics were similar. Additional research is needed to elucidate gender-related difference in tumor biology affecting the response to VS treatment.

## Skull Base

Oral presentation

The impact of internal auditory canal extension on functional outcome in vestibular schwannoma treatment

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**Objectives:** This study aims to analyze the impact of the tumor extension (TE) into the internal auditory canal (IAC) on the outcome after SRS or SURGERY in vestibular schwannoma.

**Background:** Both stereotactic radiosurgery (SRS) and microsurgical resection (SURGERY) are valuable treatment options in vestibular schwannoma (VS) patients. However, surrogate markers for the oncofunctional outcome are needed to guide treatment decision.

**Methods:** This is a retrospective dual-center cohort study (n=717) including patients with unilateral VS treated by either SRS (n=504/717, 70%) or SURGERY (n=213/717, 30%). All patients were treated between 2005 und 2011 enabling long-term follow-up. Patients were categorized in subgroups: *SmallExt*(n=253/717, 35%): small tumors(Koos I-II) with extensive TE-IAC(OHATA A-B); *SmallLim*(n=105/717, 15%): small tumors(Koos I-II) with limited TE-IAC(OHATA C-E); *LargeExt*(n=194/717, 27%): large tumors(Koos III-IV) with extensive TE-IAC(OHATA A-B); *LargeLim*(n=165/717, 23%): large tumors(Koos III-IV) limited TE-IAC(OHATA C-E).

**Results:** In the SRS group, there was a good facial (H&B<3,97-100%) and hearing outcome (G&R1-2,40-63%) independent of the OHATA-grading (p>0.05). In contrast, unfavorable facial functional outcome (H&B ≥3) of VS surgery was significantly worse in tumors with extensive TE-IAC unrelated to tumor size (*SmallExt* and *LargeExt*) (13% and 25%,p=0.0179). Hearing preservation after VS surgery was lowest in *LargeExt* (27%), with similar values (43-56%) in the other groups. However, *SmallExt* patients treated by SURGERY had a significant higher complication rate(CSF fistulas) than *SmallExt* patients treated by SRS (23% and 7%, p=0.001). OHATA A-B was associated with higher rate in subtotal-resection compared to OHATA C-E (8% and 1%, p=0.001). There was no difference in incidence of recurrence or mean-time-to-recurrence (p=0.342).

**Conclusions:** Functional preservation was independent of OHATA Classification, when VS is treated by SRS. However, extensive TE-IAC(OHATA A-B) is associated with worse postoperative facial-function after VS surgery. Small tumors with widespread TE-IAC(OHATA A-B) were associated with higher rate of postoperative CSF fistulas, probably due to the need for extensive IAC drilling.

## Oncology

ePoster presentation

### Idiopathic syringomyelia: case report of a rare entity

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**Objectives:** Herein is presented a case report of a rare entity, an idiopathic syringomyelia.

**Background:** Syringomyelia is most often associated with Chiari malformation Type I. Other etiologies such as tumours, infections and trauma are also well documented. However, there are still a few cases with no associated cause, the Idiopathic Syringomyelia. Understanding the cause and pathophysiology of the disease is key to guide the best treatment. The best management strategy for this entity is still unclear.

**Methods:** The present work presents a retrospective analysis of the clinical record of a patient admitted in December 2022. Evidence research was conducted using PubMed®.

**Results:** A 63-year-old woman presented with a 6-month history of left sided lower limb hypoesthesia, diminished proprioception, and frequent falls. There was history of cervical arthrodesis. No history of spine trauma or central nervous system infection was reported. On examination, left limb hyperreflexia, positive Babinski, left gastrocnemius and bilateral plantar hypoesthesia was noted. No motor deficit was reported. Somatosensory evoked potentials (SSEPs) documented a defect on central somato-sensory pathways conduction, predominantly on the left side. MRI revealed a median and left paramedian syringomyelic cavity from D4 to D9. The patient was admitted for surgery. Under SSEPs and motor evoked potentials (MEPs) monitoring, a D5 and D6 laminotomy was performed, with midline durotomy and myelotomy. After seryngostomy, a tailored piece of a lumbar drain was inserted into the syringomyelic cavity with the distal end sutured to the subarachnoid space with 5-0 Prolene. At 1-month post-operative examination, the patient showed slight improvement. 4-months MRI reveled significant improvement.



**Conclusions:** Idiopathic Syringomyelia is a rare condition, with no tailored approach proven to be preferable. Further investigation is necessary in order to provide the best treatment possible. Previous spine surgery might be an aetiology to consider.



## Skull Base

Oral presentation

Radiosurgery-associated new-onset facial spasm after the treatment of vestibular schwannoma is associated with incidence of recurrence

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**Objectives:** This study aims to analyze and compare patients with new-onset facial spasm (FS) and patients without (FS) after radiosurgery.

**Background:** Facial function preservation in the care of vestibular schwannoma (VS) is pre-dominantly measured in motoric function (e.g. House-Brackman (HB)). Facial spasm (FS) has been reported to be a possible side-effect in the radiosurgical treatment of VS.

**Methods:** This study aims to study the incidence of FS in the treatment of VS. Patient medical records of patients treated by treatment of VS were analyzed retrospectively. N=1'998 were treated by stereotactic radiosurgery (SRS) between 2004 and 2020. Patient and tumor characteristics were analyzed (i.e., sex, age, tumor extension and size, intracanalicular extension).

**Results:** N=104/1'998 (5%) of all patients treated by SRS presented with new-onset FS postinterventionally. FS was unrelated to tumor size. The incidence of new-onset FS was significantly higher in women (6%) compared to men (4%) (p=0.032). From all patients with FS, N=24/104 (23%) of new onset FS appeared after Re-SRS (second SRS treatment). In primary SRS therapy, facial spasm was associated with a higher recurrence rate of N=20/80 (25%) vs N=252/1'894 (13%) in nonFS patients (p=0.007). N=65/104 (62%) were permanent FS, whereas N=41/104 (39%) recovered spontaneously between 4 and 34 months, postinterventionally. The proportion (76%) of FS patients had tumors with extensive intra-canalicular extension (OHATA A-B) was higher in compared to a nonFS control group (64%) (p=0.015).

**Conclusions:** FS is a SRS therapy-related side effect with an overall incidence of 5%. Women were more commonly affected by new-onset SRS. Second-line SRS has the highest risk for new-onset FS. FS was associated with a higher incidence of recurrence compared to non-FS VS patients. Patients' consultation should address the relevant side effect.

## Skull Base

Oral presentation

Number-needed-to-treat/Number-needed-to-harm as a new perspective on risk-benefit-ratio comparing gamma-knife-radiosurgery with microsurgery as a monotherapy in large vestibular schwannomas(Koos III-IV)

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**Objectives:** The aim of this study was to analyze the risk-benefit-ratio in the treatment of large vestibular schwannoma (VS)(Koos III-IV) comparing SRS and SURGERY.

**Background:** Both stereotactic radiosurgery (SRS) and microsurgical resection (SURGERY) are available as treatment-options for VS. If treated with monotherapy alone, SRS has shown to be inferior in tumor control, but superior in facial-nerve-preservation compared to SURGERY in VS of large size(Koos III-IV).

**Methods:** This is a retrospective dual-center cohort study enrolling consecutive patients with solitary VS between 2005 und 2011 to enable long-term follow-up. Facial-function was reported by House-Brackmann(H&B1-2=good outcome), and recurrence was assessed by contrast-enhanced MRI. The absolute-risk-reduction (ARR), absolute-risk-increase (ARI), the number-to-operate (NNO) and the number-to-harm (NNH) were computed.

**Results:** The study population included N=492 patients with large VS(Koos III-IV). Of them N=260(53%) were treated with SRS and N=232(47%) with SURGERY. The SRS treatment-arm presented with a recurrence-rate of 14.2%, and SURGERY with 3.0%. Therefore, ARR for recurrence was 11.21%(95% CI: 6.4%-16.0%) with a NNO of 9(95% CI: 6.3-15.6) in SURGERY meaning that one in every 9 patients will benefit from SURGERY. When analyzing facial-nerve-deterioration, SRS presented with 6.9%, and SURG with 12.5% adverse facial nerve outcome resulting in an ARI of 5.6%(95%CI: 0.3%-10.8%) and a NNH of 18(95%CI:9.2-312.1).

**Conclusions:** The analysis of the different proportion in success/harm in the management of large VS (SRS vs. SURGERY) in this cohort yielded in a low NNO, combined with a high NNH, meaning that SURGERY was superior to SRS considering tumor control. Still, the direct translation of these results into treatment recommendations is not self-evident, but multi-faceted: This analysis is a vivid representation of a dilemma well-known to neuro-oncological surgeons - the equilibrium between tumor-control and functional-outcome. Large VS should only be treated in specialized centers, which have enough experience to ensure a high-rate of facial-preservation in large VS.

## Spine

Oral presentation

Screening for degenerative cervical myelopathy (SCREEN-DCM): preliminary results of an ongoing prospective multicenter study

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**Objectives:** Screen patients with lumbar pathology for Degenerative Cervical Myelopathy (DCM), and develop an effective strategy to uncover DCM.

**Background:** DCM is the commonest cause of spinal cord impairment, but remains under-diagnosed. Given that Lumbar degenerative disease (LDD) is one of the most common problems encountered in neurosurgical practice, and with a high prevalence of tandem stenosis, the present study sought to screen this population to uncover undiagnosed DCM.

**Methods:** A survey of 13 neurosurgeons was used to develop and modify screening criteria, and screening was performed primarily for patients with LDD. Points were attributed based upon the presence of signs/symptoms (e.g. Hoffman sign) and for comorbidities associated with DCM (e.g. Rheumatoid arthritis). Patients with <sup>3</sup>3 points underwent MRI examination to confirm DCM. An exploratory multivariate analysis of the effectiveness and efficiency of this proposed screening test will be evaluated after positively screening 50 patients for DCM.

**Results:** Out of 140 patients screened, 43 screened positive ( $\geq 3$  points) and 36 had a subsequent cervical MRI. Of the 36 patients, 11 (30.6%) were diagnosed with DCM, and 4 of these (36.4%, 4/11) were eventually operated. The average number of points for patients screening positive with a diagnosis of myelopathy was 5.36 vs 4.12. All patients with myelopathy were considered as mildly myelopathic. Nine out of the 11 positive patients (81.8%) had T2WI hyperintensity signal changes on MRI. An additional 9 out of the 36 (25.0%) patients presented with cervical canal stenosis without clear evidence of spinal cord compression or sufferance.

**Conclusions:** Screening in patients with LDD appears resulted in a diagnosis of DCM in over 30% of patients having an indication for an MRI. Additionally, screening identified an 25% of individuals with cervical stenosis but without clear myelopathy. These are preliminary results and further analysis from this multicenter study are expected within a year.

## Education, Ethics, Socioeconomic

ePoster presentation

### Novel application of a tele-stroke care unit system in a Japanese hospital

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**Objectives:** We designed a tele-SCU system that allows remote support by stroke specialists for hospitals with limited human resources. The present study aimed to evaluate the feasibility of this novel system.

**Background:** The Japanese stroke care units (SCUs), which provide intensive acute stroke care, are widely established in Japan. However, the government plans to place legal limits on the overtime work of medical doctors.

**Methods:** The system consists of a live-streaming function and medical image viewers for a local SCU in a local hospital and a remote center in a university hospital using an ISO27001 compliant Join Live View application (Allm Inc, Japan). The system allows doctors in a remote center to display a live-streaming video of patients from ceiling network cameras and communicate with local medical staff or patients using a wireless speakerphone. The remote doctors can manipulate a 360-degree pan-tilt-zoom of network cameras. We evaluated the video and audio quality of this system and remotely assessed National Institutes of Health Stroke Scale (NIHSS) of patients.

**Results:** The remote doctors could observe the whole body of patients on the bed and their face with sufficient quality images using the zoom in and zoom out functions of the network camera. The middle-magnification image was suitable for evaluation of a patient's motor function and the high-magnification image allowed evaluation of facial palsy and eye movements. The visual and audio qualities of the system were sufficient for remote communication among medical staff or for the medical examinations of patients. Remote doctors were able to assess each category of NIHSS with or without the assistance of local medical staff.

**Conclusions:** The tele-SCU system demonstrated sufficient audio-visual quality for effective medical communication and examinations. The system would be effective for future remote management of acute stroke in hospitals with limited stroke specialists.

## Global Neurosurgery

ePoster presentation

### Bibliometric analysis of neurosurgical publication of Portuguese-speaking African countries (PALOPS)

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**Objectives:** To analyze the scientific production of Portuguese-speaking African countries in Neurosurgery until June 2023.

**Background:** Portuguese speaking African countries (PALOPS) is a community composed by six countries (Angola, Mozambique, Cabo-Verde, São Tomé e Príncipe, Guinea-Bissau and Equatorial-Guinea), in those countries Neurosurgery has very limited resources for clinical practice and research.

**Methods:** We Performed a Bibliometric analysis of scientific papers published by Neurosurgeons from PALOPS, Pubmed and web of science were searched on 4<sup>th</sup> June 2023, using the Keywords "Neurosurgery AND name of each country", list of authors and full filiations were screened to confirm the presence of at list one PALOP author, after this as PALOPS has a limited number of Neurosurgeons a new search was performed using the Neurosurgeon name one by one. Inclusion criteria were Filiation in the article expressing the name of the country. Exclusion criteria was paper with an PALOP author who do not express filiation with a national institution.

**Results:** In initial Search using de keywords 56 papers were found after reading authors filiations 23 were included for final analysis, after this a manual search were performed and more 12 papers were included, total of papers 35, from this 16 were From Angola, 5 Mozambique 1 Cape Verde and Guinea Bissau a none from São Tome and Equatorial Guinea, papers with first author from PALOPS were 20 and the scientific periodics with more publications were World Neurosurgery and Autopsy Case Reports, countries with more co-authors were Brazil and Portugal. Author with more papers and citations was De Oliveira, AJM. The most of papers are Retrospective studies (16) and Case Reports (12).

**Conclusions:** Neurosurgery researches in PALOPS need to improve in number and quality for this international cooperation is one of the ways.

## Endovascular Neurosurgery

Oral presentation

Basilar artery perforator aneurysm - a diagnostic and therapeutic conundrum

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**Objectives:** Sub-arachnoid hemorrhage (SAH) resulting from rupture of basilar artery perforator aneurysm (BAPA) is a neurological rarity. With increased awareness and advancements in imaging modalities, they are now more frequently detected. However concerns regarding their suboptimal treatment and lack of proper analysis still exist. We are reporting our experiencing of treating this entity in a small cohort along with analysis of the existing literature.

**Background:** 1. To study the natural history and treatment outcome of this extremely rare entity  
2. Efficacy of flow diversion in basilar perforator aneurysms

**Methods:** All cases of SAH resulting from ruptured BAPA treated by the same surgical team were retrospectively analyzed. Demographic data, treatment characteristics and follow up data of our cases along with published literature were studied.

**Results:** Our cohort comprised of five patients (Mean age 55 years). 3 cases were treated with flow diverter alone and the rest underwent flow diverter and overlapping stent placement. Initial diagnostic cerebral angiography (DSA) was negative in 3 of them. There was one mortality and favorable outcome was encountered in the remaining cases. All of them demonstrated complete occlusion of the aneurysm in follow up. Our systemic review yielded 80 cases treated by conservative, open surgical and endovascular methods. Overall re-bleeding, major morbidity and mortality rates were 16%, 22.5% and 7.5% respectively.

**Conclusions:** We were successful in achieving complete angiographic occlusion of the aneurysm in all the cases post treatment. In available literature, studies have small sample sizes. Future randomised studies in a larger cohort and proper reporting and analysis of outcomes will help us formulating a treatment protocol for BAPA.

## Endovascular Neurosurgery

ePoster presentation

Efficacy and outcome of embolisation of intra cranial meningiomas with minimal resources

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**Objectives:** To conduct embolisation of meningiomas in a resource constrained setting with minimal resources.

**Background:** Pre operative embolization of intracranial meningiomas is an accepted treatment modality and offers many advantages for subsequent surgery. It has also been employed as a primary therapy without subsequent surgery in selected cases. In this study, the authors share their experience of this procedure with minimal resources carried out in cases where definitive surgery was not advisable.

**Methods:** This is a prospective study of 6 cases of meningiomas treated over a period of 11 months (November 2020 to September 2021). None of the cases were fit for prolonged surgery under general anesthesia and had certain comorbid conditions too. Embolisation was done in a set up with limited resources without a fully equipped cathlab. Post procedure Magnetic Resonance Imaging (MRI) was done within 48 hours of the procedure. Follow up was done in the outpatient department.

**Results:** There was complete disappearance of tumour blush in all the 6 cases. Immediate post procedure MRI revealed significant necrosis of the tumour cavity. 3 cases succumbed to their primary co-morbid conditions and in other cases follow up was uneventful. Following embolization, clinical improvement of presenting symptoms was seen in all 6 cases.

**Conclusions:** In Resource-Restricted Settings, by introducing such innovative methods it is possible to perform selected endovascular procedures. Embolisation can be used as a primary treatment modality avoiding subsequent surgery in selected cases with a good outcome.

## Functional

Oral presentation

A MRI and DTI study of median nerve in carpal tunnel syndrome with clinico radiological correlation

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**Objectives:** 1. To detect equivocal cases of CTS with advanced modalities of investigation  
2. To define an imaging protocol for CTS

**Background:** Carpal tunnel syndrome (CTS) is the most frequent focal neuropathy. However in patients with CTS symptoms with equivocal electrophysiological findings, diagnosis can be difficult. Aim of our study was to study the feasibility of MRI and DTI in diagnosing equivocal cases of CTS.

**Methods:** Prospective study of CTS cases over a period of consecutive two years was done. Following clinical examination and ENMG studies, 14 patients and healthy controls each underwent MRI and DTI wrist and results were compared. Based on findings, ten cases were diagnosed of CTS and underwent surgery. After six months of surgery, five cases underwent MRI and DTI. Pre and post op results were compared.

**Results:** Volar bowing, median nerve hyper-intensity and increased cross sectional area of the median nerve were the most frequent MRI findings in CTS. In DTI of both groups, age influenced FA and ADC values. Statistically significant negative correlation between the severity of CTS with mean FA and positive correlation with mean ADC were seen. Also ADC values decreased from proximal to distal along the course of the nerve but change FA values were not statistically significant. Changes in FA and ADC values post op were not statistically significant.

**Conclusions:** MRI and DTI have the potential to be important diagnostic tools for the diagnosis of CTS. However, similar age-related changes in diffusivity and anisotropy may weaken DTI specificity. Slice-wise analysis is necessary for detection of local changes in nerve integrity. Early post op MRI has poor correlation with clinical outcome.



## Skull Base

ePoster presentation

### Stereotactic radiosurgery as a promising treatment strategy for meningiomas grade II and III: a systematic review and meta-analysis

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**Objectives:** This study aimed to systematically review the clinical outcome of patients with atypical or anaplastic meningioma who underwent radiosurgical approach to highlight the clinical impact of SRS on the management of grade II and III meningioma.

**Background:** Meningiomas are the most prevalent benign intracranial tumors. The majority of lesions are WHO Grade I, but 10% of them show signs of malignancy with increased recurrence rates, 30-50% for WHO Grade II, and 50-94% for WHO Grade III. Wherever they show the characteristics of invasive behavior, as in grades II and III, they can recur rapidly and present a real challenge for a neurosurgeon.

**Methods:** Medline via PubMed was searched from inception to December 2022 to retrieve the studies looking toward the radiation therapy for patients with meningioma grade II and III. The gray literature was also investigated through manual search of Google Scholar.

**Results:** A total of 29 articles on 1,446 patients were included in the present study. Of 29 studies, 11 studies were exclusively conducted on patients with atypical meningioma (grade II), one study on anaplastic meningioma, and 17 studies were carried out on grades II and III. The pooled 1, 2, 3, 5, and 10-year overall survival (OS) of atypical meningioma was 0.96 [95%CI:0.92-1.01, I<sup>2</sup>:0.00%, P=0.00], 0.89 [95%CI:0.72-1.06, I<sup>2</sup>:97.73%, P=0.01], 0.90[95%CI:0.84-0.96, I<sup>2</sup>: 51.78%, P=0.09], 0.81 [95%CI:0.74-0.87, I<sup>2</sup>: 73.22%, P=0.00], and 0.66[95%CI:0.60-0.71, I<sup>2</sup>:0.00, P=0.55], respectively. The pooled 2,5, and 10-year OS of anaplastic meningioma was 0.64[95%CI:0.29-0.99, I<sup>2</sup>: 91.85%, P=0.00], 0.41[95%CI:0.16-0.66, I<sup>2</sup>: 91.85%, P=0.00], and 0.19[95%CI: -0.20-0.59, I<sup>2</sup>: 96.13%, P=0.00], respectively.

**Conclusions:** The outcomes of stereotactic radiosurgery treatment appear promising regarding overall outcome and progression-free survival. It can be used confidently in primary grade II meningiomas without the need for waiting for a recurrence. SRS may be used as the sole treatment of meningiomas with promising outcomes and acceptable complication profile.

## Spine

Oral presentation

### Comparison of anterior-posterior staged approach versus one-stage posterior approach for adult spinal deformity correction

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**Objectives:** To compare the radiologic and clinical outcome of anterior-posterior staged operation versus one-stage posterior approach for adult spinal deformity correction.

**Background:** The addition of anterior approach for adult spinal deformity correction surgery can be a powerful tool, due to its use of hyper-lordotic cage, allowance for larger fusion surface, and less invasiveness to musculature structure. However, there are only few direct comparison studies between anterior-posterior staged approach and one-stage posterior approach.

**Methods:** From January 2014 to May 2021, a total of 298 patients who received correction surgery for adult spinal deformity in a single institution were collected. 67 patients with data of minimum of 2 year follow up were retrospectively reviewed. Various radiologic parameters and clinical outcome data were measured and compared at baseline, immediate post-op, and 2-year follow up respectively.

**Results:** Among the 67 patients, 24 patients received anterior-posterior staged operation and 43 patients received posterior-only one-stage operation. Staged approach had less total blood loss (1692cc < 2075cc), but had longer surgery time (461 min > 405 min) and longer hospital stay (28 day > 23 day). Staged operation required less high-grade osteotomy of grade  $\geq 3$  (12.5% < 30.2%). Baseline major Cobb's angle was larger in staged operation group (25.2 > 12.2) and had larger angle of correction postoperatively at both immediate follow up and 2-year follow up (17.9 > 8.4, 17.1 > 7.2). PI-LL (pelvic incidence - lumbar lordosis) mismatch correction was also higher in staged group at both immediate and 2-year follow up (33.2 > 28.3, 32.2 > 22.2). There were no significant difference in mechanical complication rates and clinical outcomes in both groups.

**Conclusions:** With anterior-posterior staged approach, it is more advantageous for both coronal and sagittal angle correction with relatively low osteotomy grade and less blood loss. However, the total operation time and in-hospital days inevitably increase. There was no significant difference in terms of outcome.

## Neurovascular Surgery

Oral presentation

### Intraoperative arterial spin labeling MRI in surgical revascularization

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**Objectives:** Development of principles for dynamic evaluation of cerebral blood flow (CBF) using intraoperative ASL MRI during surgical revascularization in patients with chronic cerebral ischemia in order to determine indications for additional bypasses.

**Background:** The effectiveness of surgical revascularization in patients with chronic cerebral ischemia directly depends on the degree of restoration of CBF. The current methods do not take into account dynamic changes in cerebral perfusion after the bypass. Intraoperative ASL MRI allows to determine revascularization tactics using single or double bypasses directly during surgical intervention.

**Methods:** From April 2022 to April 2023 in Burdenko Neurosurgical Center 27 patients underwent surgical revascularization (STA-MCA extra-intracranial bypass) with intraoperative MRI. Among them were 14 patients with post-thrombotic occlusion of the internal carotid artery or middle cerebral artery and 13 patients with Moyamoya disease. All patients underwent a comprehensive preoperative MRI study. During the surgical intervention after applying the first bypass intraoperative MRI (DWI, ASL, 3DTOF sequences) was performed in order to determine localization of zones of residual hypoperfusion, to identify signs of local hyperperfusion and to determine indications or contraindications for additional brain revascularization with the second donor branch. In 10 cases, the single bypass was not enough to restore CBF, and a second bypass was performed.

**Results:** In all cases, complete restoration of CBF was achieved in the target areas of the brain. Postoperative MRI, performed on the 1st day after surgery, confirmed the reliability of intraoperative MRI data. In early postoperative period immediate improvement of clinical symptoms was seen in 70%. There were no postoperative complications in any patient.

**Conclusions:** Intraoperative ASL MRI is an effective and useful tool to determine the degree of CBF restoration directly during the surgery that allows to adjust the tactics of surgical treatment and to determine indications or contraindications for the additional revascularization and exclude early ischemic complications.

## Oncology

ePoster presentation

An epidermoid tumor case after excision of benign cystic teratoma located in conus medullaris

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**Objectives:** We aimed to report an epidermoid tumor that appears after gross total teratoma resection.

**Background:** Spinal teratomas are rare; they constitute 0.1% of cord tumors and contain tissues originating from three germ sheets. The aim of surgery in spinal teratomas is the total removal of the mass. However, tumors in the conus medullaris potentially cause significant morbidity.

**Methods:** A 19-year-old female patient was admitted with complaints of low back pain and numbness on the back of the left leg for five years. The Babinski reflex was bilateral dorsal, Achilles and patella reflexes were hyperactive. Magnetic resonance imaging (MRI) showed a tethered cord and an intradural lesion at the L4 level (**Figure1A**). During the surgery, a part of the teratoma capsule was left not to damage the neural tissues and the cord released. Postoperative neurological examination was stable. Histopathological examination was a benign cystic teratoma (**Figure1B**). Thirty-three months later, a cystic lesion appeared at the same level (**Figure1C**). A microscopic total mass excision was performed, and again the cord was released. Perioperatively the mass was a pearly white. The postoperative neurologic examination, left ankle extension muscle weakness (4/5+), urinary incontinence, and hypoesthesia in the perianal and genital area were observed. Histopathological examination of the lesion was reported as an epidermoid cyst (**Figure1D**).



**Results:** Spinal epidermoid tumors constitute less than 1% of spinal tumors. These tumors may be congenital or acquired and occurs displacement of epidermal cells into the spinal canal. In our case, the epidermoid cyst occurred either through transplantation of the epidermal layer into the operation area during the teratoma excision or from the rest of the tumor capsule.

**Conclusions:** Our case suggested that conus medullaris teratomas are like a double-edged sword. While incomplete resections lead to epidermoid cysts, complete resection causes neuro deficiencies.

## Trauma

Oral presentation

Characteristics of patients who developed acute subdural hematoma while taking antithrombin agents and were treated with reversal agents

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**Objectives:** We investigated the patient background and outcome of a group of patients who developed acute subdural hematoma while taking antithrombin agents and were treated with a reversal agent. We also investigated the effect of the timing of reversal agent administration on outcomes.

**Background:** Japan is the first nation to become a hyper-aging society and may serve as a role model for design of therapeutic strategies for elderly patients. With the aging society, the frequency of taking antithrombotic drugs is increasing, and the number of head injury cases taking antithrombotic drugs is increasing. Therefore, countermeasures, including reversal therapy, for patients with head injury who are taking antithrombotic drugs are required.

**Methods:** A retrospective multicenter observational study was performed in patients aged  $\geq 65$  years who developed acute traumatic subdural hematoma during treatment with dabigatran and underwent reversal therapy with idarucizumab. The items examined included patient background, neurologic and imaging findings at arrival, course after admission, and outcomes.

**Results:** A total of 23 patients were enrolled in the study. The patients had a mean age of 78.9 years. The cause of head injury was fall in 60.9% of the subjects. The mean Glasgow Coma Scale score at arrival was 8.2, anisocoria was present in 31.8% of cases. Exacerbation of consciousness was found in 30.4%, but only in 14.3% of subjects treated with idarucizumab before consciousness and imaging findings worsened. The favorable outcome rate was 21.7% and mortality was 39.1%.

**Conclusions:** Reversal therapy with idarucizumab was focused on severe rather than mild cases in Japan. Regarding the timing of idarucizumab administration, early administration before disease progression may have a positive impact on outcome.

## Global Neurosurgery

Oral presentation

### Pediatric brain tumors in Sub-Saharan Africa: a systematic review and meta-analysis

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**Objectives:** This study aimed at systematically analyzing the distribution of PBT types in SSA.

**Background:** Brain tumors are a worldwide problem leading to higher cancer-related morbidity and mortality rates in children. Despite the progressive though slow advances in neuro-oncology care, research, and diagnostics in Sub-Saharan Africa (SSA), the epidemiologic landscape of pediatric brain tumors (PBT) remains underestimated.

**Methods:** OVID Medline, Global Index Medicus, African Journals Online, Google Scholar, and faculty of medicine libraries were searched for literature published before October 29th, 2022. A proportional meta-analysis was performed in R.

**Results:** 49 studies, amounting 2366 children, met the inclusion criteria for review, and only 20 (40.82%) of them were included in the quantitative analysis. South Africa and Nigeria were the countries with the most abundant data. Medulloblastoma was the common PBT in the 4 SSA regions combined and was more commonly reported in southern SSA ( $p=0.001$ ) than other regions. A random-effects model found the overall pooled proportion of the 5 common PBT at 0.23 (95%CI[0.17-0.32]), 0.18(95%CI[0.14-0.22]), 0.14(95%CI[0.08-0.25]), 0.12(95%CI[0.09-0.15]), and 0.09(95%CI[0.06-0.12]) for astrocytoma NOS, medulloblastoma, glioma, craniopharyngioma, and ependymoma respectively. Sample size moderated the estimated proportion of astrocytoma NOS ( $p=0.002$ ). The highest proportion of astrocytoma NOS and craniopharyngioma were in Western SSA, medulloblastoma in central SSA, ependymoma in eastern SAA, and glioma in southern SSA.

**Conclusions:** Our findings provide an insight in the trend of PBT types and the proportion of the top 5 common tumors across SSA. Though statistical conclusions are difficult due to the inconsistency in the data, our study identifies critical areas for policy development and collaborations that can facilitate improved outcomes in PBT in SSA. There is a need for more accurate epidemiological studies of these tumors to better understand the burden of the disease and the geographic variation in their distribution, to raise awareness in their subsequent management.

## Functional

Oral presentation

### Robust quantification of neuroplastic effects following cortical stimulation

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**Objectives:** The primary objective was to induce circuit-specific neuroplasticity using different electrical stimulation protocols. The secondary objective was to assess the spatial and temporal features of cortical responses.

**Background:** Cortical stimulation is becoming increasingly used in functional neurosurgery to treat neurological disorders such as epilepsy and depression. However, the development of stimulation protocols still relies on a 'trial-and-error' approach with there being little understanding of how these protocols affect neuroplasticity in the cortex.

**Methods:** This is an ongoing prospective study including patients who have been implanted with intracranial electrodes. Repetitive electrical stimulation is delivered to different cortical sites using two different protocols. These include intermittent theta bursts stimulation (iTBS) and continuous 1Hz stimulation. The cortical response was measured by calculating the line-length of single-pulse cortico-cortical evoked potentials.

**Results:** In our cohort of four subjects so far, we have measured the effects of delivering our repetitive stimulation protocols to prefrontal and temporal cortex. Our iTBS protocol can reliably induce a potentiation effect that persist for over 20 minutes. By contrast, continuous 1Hz stimulation initially causes a depressive effect which is followed by a paradoxical rebound potentiation. Furthermore, the effects appear to be localised anatomically to cortical regions near the stimulation site.

**Conclusions:** Our findings provide a new and more robust measure of assessing cortical neuroplasticity induced by repetitive electrical stimulation. A deeper understanding of these neuroplastic effects will allow for a more tailored approach to using cortical stimulation to treat neurological disorders.

## Epilepsy

Oral presentation

Long-term clinical outcomes of patients receiving modified anatomical hemispherectomy for treatment of refractory epilepsy

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**Objectives:** The primary objective was to measure seizure burden in patients with refractory epilepsy who received a modified hemispherectomy. The secondary objective was to assess the effect on neurocognitive comorbidities.

**Background:** In the 1980s a modified approach to the anatomical hemispherectomy was developed at the Radcliffe Infirmary in Oxford which included extending the extradural space in order to prevent delayed haemorrhagic complications. The long-term efficacy of this unique surgical approach in managing refractory epilepsy and its comorbidities has not been evaluated.

**Methods:** This was an observational study that included a retrospective analysis of people who received the modified anatomical hemispherectomy at the Radcliffe Infirmary between 1980 - 2000.

**Results:** In our cohort ( $n = 49$ ), most people presented with focal to bilateral tonic clonic seizures (59%) caused by an underlying structural aetiology (51%). 63% achieved seizure freedom within the first five years following surgery. 51% of individuals were withdrawn from all anti-seizure medications and within this group 80% had no further relapse of seizures. Post operatively, 69% of people improved in neurocognitive tasks while 80% showed an improvement in their behaviour. There was a significant relationship between reaching seizure freedom and improvement in neurocognitive ( $OR\ 9.6, p = 0.002$ ) and behavioural ( $OR\ 6.5, p = 0.02$ ) symptoms. Over a third of people (20, 33%) had post-operative complications with 9 of these being wound infections. We found no association between the presence of an immediate postoperative complication and the effect on seizure burden or neurocognitive profile.

**Conclusions:** This study reveals that although, now less utilised, the modified anatomical hemispherectomy is an effective surgical approach to treating refractory epilepsy and improving seizure-related comorbidities.



## Oncology

Oral presentation

*NFKBIA* haploinsufficiency reshapes the epigenome and influences outcome in diffuse gliomas

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**Objectives:** Assess association of *NFKBIA* deletions with other genetic markers and glioma patient outcome. Identify molecular mechanisms of *NFKBIA* deletion oncogenicity.

Develop a nomogram incorporating *NFKBIA* deletions for predicting outcome.

**Background:** Genetic alterations help predict clinical behavior of diffuse gliomas. Glioma tumor suppressor *NFKBIA* (Chr14q13.2) interacts with histones H2A/H4 and polycomb to regulate transcriptional repression in stem cell maturation, lineage specification, and cancer. We investigated relationships between *NFKBIA* deletion and genetic markers, methylome changes, and clinical course.

**Methods:** Genetic profiles of 2,343 adult diffuse gliomas from seven well-characterized study populations were analyzed employing standard methods for tissue collection, cell culture, D-2HG biochemistry, genomic DNA preparation, and gene knockdown/silencing and for assessing gene copy number, mutation, expression, and methylation. Statistical methods included Cox models (proportional-hazard regression, likelihood-ratio test), Fisher's exact and McNemar tests, Kaplan-Meier survival estimation, and nomogram modeling.

**Results:** Deletions of *NFKBIA* have distinct patterns of occurrence relative to other critical genetic markers, are disproportionally present at recurrence (OR=5.33, p=0.0006; 16% v 26.4% and 45.5% for initial v singly and multiply recurrent), and are associated, independent of other genetic and clinicopathologic predictors, with unfavorable outcomes (median survival: 4.3 vs. 8.0 years (HR=2.83, p=0.00012) for non-deleted tumors).

*IDH*-mutant gliomas with *NFKBIA* deletions have worse outcomes than those without deletions – median survival: 3.8 vs. 7.6 years (HR=2.74, p=0.004) and 6.8 vs. 14.3 years (HR=2.53, p=0.015) in two study populations – and thus more closely resemble *IDH*-wildtype tumors.

*NFKBIA* deletions alter DNA and histone methylation antithetically to *IDH* mutations and similarly to *H3K27M* mutations of diffuse midline gliomas: demethylation of CpG sites and loss of repressive histone H3K27 trimethylation marks.

In a predictive nomogram for *IDH*-mutant gliomas, *NFKBIA* deletions predict comparatively brief survival.

**Conclusions:** *NFKBIA* haploinsufficiency aligns with distinct epigenome changes, disease progression, and poor prognosis, and should be incorporated into future models predicting diffuse glioma behavior.

## Skull Base

Oral presentation

Quality of life in patients with skull base meningiomas treated with microsurgery: a prospective observational study

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**Objectives:** 1. To Evaluate QOL at Pre-Surgery, 3 months and 1 year post microsurgery in patients of SBM.  
2. To Compare QOL in patient of SBM with that of normal population and chronic disease patients like Diabetes Mellitus (DM).

**Background:** Skull base meningiomas (SBM) are common entities whose surgery may result in complications. Hence, it is necessary to study the impact of microsurgery on quality of life (QOL) in such patients in deciding the modality of treatment in each individual patient.

**Methods:** A prospective observational study was conducted on 36 patients who had undergone microsurgery for SBM for comparing the QOL with that of diabetic patients and healthy population using SF-36 questionnaires.

**Results:** At 3 months follow up post surgery, out of 36 patients, 7 had a drop in Role Limitations Due to Physical Health (RLPH) score >50%, while at 1 year, 5 of those improved to preoperative status and 2 remained unchanged; 28 patients remained unchanged throughout post-operative course.

At 1 year follow-up, there was a deterioration of the Role Limitations Due to Emotional Problems (RLEP) score to <50 % in 1 patient and 8 improved their scores to > 50% from pre-operative score. 27 remained unchanged.

Statistically significant improvement ( $p < 0.05$ ) was found in all other domains of SF-36 which showed progressive improvement when compared preop to 3 month post-op and 1 year.

**Conclusions:** Patients with improved scores showed a steady improvement through each follow-up period, except in 2 domains, although there was a transient worsening of score in immediate post-operative period. In comparison to the DM patients, the skull base meningioma patients had a better score of SF-36 at 1 year follow-up period in all parameters except for the RLEP and RLPH. Appropriate counselling of transient setback and subsequent recovery over a year is advisable.

## Neurovascular Surgery

Oral presentation

Morphological changes in the brain in patients with COVID-19 and clinical manifestations of cerebrovascular accident

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**Objectives:** To identify morphological and immunohistochemical (TSP-1, p-53) characteristics of brain tissues in cases of cerebrovascular accident with a fatal outcome in patients with COVID-disease.

**Background:** Coronavirus disease induces hypercoagulant states and systemic circulatory disorders, including cerebral circulation, what determines urgency of the problem.

**Methods:** 5 observations (lethal cases) with clinical manifestations of cerebrovascular accident for ischemic and mixed type on the background of pneumonia. 4 men, 1 woman, age - 45 to 72 years. The etiology of COVID-19 was confirmed by PCR. Terms of increase of symptoms - from 2 to 23 days. 2 were operated on (removal of stroke hematomas). Histological methods are standard, MSB staining, Nissl with thionin. Immunohistochemical detection of antigen detection using the UltraVision Quanto System Peroxidase polymer and DAB plus chromogen, reagents from Thermo scientific: (TSP-1), p-53. Morphometry of olfactory bulb cells was made. Statistical processing of the obtained results was carried out using the STATISTIKA 10.0 program (StatSoftInc., series No. STA999K347156-W).

**Results:** In the substance of the brain, acute hypoxic-ischemic changes, lacunar infarctions with endothelial dysfunction, neuronophagia, satellite disease, demyelination with axonal balls, focal astrogliosis, microglial nodules, focal lymphoid inflammation were found. In the olfactory bulbs - a decrease in the density of specialized neurons with correlations with the timing of the disease. The expression of thrombospondin in the areas of myelin destruction was revealed, what can indicate acute asynapsia.

**Conclusions:** The histochemical determination of TSP-1 can be a marker of damage to the myelinated pathways of the brain and is a criterion for damage to brain tissue synapses in Covid disease. Systemic microcirculation disorders with vasoconstriction and ischemia growth, inflammation and tissue edema are distant manifestations and consequences of Covid disease. The studies carried out make it possible to approach the understanding of pathogenetic changes in the brain in covid disease.

## Trauma

ePoster presentation

Experience of chitosan and gelatin-based biopolymer films using for dura matter plasty in experimental traumatic brain injury

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**Objectives:** To investigate the effects of chitosan/gelatin-based biopolymer films using for dura matter plasty in experiment.

**Background:** Biodegradable materials are of particular interest for dura matter (DM) reconstructive surgery.

**Methods:** The study involved 15 animals (white outbred rats) weighing 250-300 g, which were divided into 3 groups: 1) DM plasty using chitosan films. 2) DM plasty using a chitosan film in combination with a gelatin film. 3) Autoplasty group. All animals were simulated penetrating traumatic brain injury (pTBI) with decompressive craniectomy of the skull and subsequent DM plasty with the indicated polymer films. In the trauma model, hemorrhagic contusion focus, decompressive bone window and DM incision are reproduced.

The animals were removed from the experiment at 21 days after surgery, the healing process was monitored by optical and confocal laser microscopy Carl Zeiss LSM-510 META with lenses Plan-Neofluar 40x/0.6 Korr, and camera Zeiss AxioCam. Luminescent images obtained by excitation with lamp UV HBO 100 with blue (FSet01 wf), green (FSet10 wf) and red (FSet20 wf) filters, as well as, by excitation by lasers with wavelength 405, 488, 543 nm. Histological sections were obtained and stained according to the standard method.

**Results:** Corellation analysis of the densitometry results and microscopic parameters of the regenerated DM showed a direct relationship between the characteristics of the regenerated DM and the intensity of collagen autofluorescence in the DM when excited by a laser with  $\lambda$  em- 488nm (green). Significant correlation of selected indicators were established in all groups.

**Conclusions:** Our experimental data indicate the benefit of using biopolymer films for the brain injury tasks and its positive impact of the healing process. The highest indicators of collagen autofluorescence and total thickness with a two-layer structure close to the intact DM in group 2 were revealed.

## Skull Base

ePoster presentation

### Efficacy of Gamma Knife Radiosurgery in small to medium sized vestibular schwannomas: a single-centre Indian study

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**Objectives:** To study the outcome following Gamma Knife Radiosurgery (GKRS) in patients with small to medium sized Vestibular schwannoma.

**Background:** Available treatment strategies for vestibular schwannoma (VS) includes observation, microsurgery, and stereotactic radiosurgery (SRS).

**Methods:** Between 2009 and 2021, 294 patients had undergone GKRS for vestibular schwannoma at our center. The median margin dose was 13 Gy. The patients have been divided into sporadic (N = 277) and NF-2 (N = 17). Sporadic VS cohort has been classified as primary and post-microsurgery GKRS. The patients have been evaluated for pre and post GKRS tumour size, radiation dose and hearing status.

**Results:** The follow up available was 56.7% with a mean follow-up duration of 3.6 years in the sporadic cohort, which showed a tumour control rate of 95.04%, with a modest 4.96% rate of additional microsurgical interventions. Post-operative and post GKRS cohort had a control rate of 92.8%. With a higher follow-up rate of 82.4% and a mean follow-up duration of 5.2 years, our NF-2 cohort showed a tumour control rate of 92.8%. Out of 17 patients with NF-2, 10 received GKRS as primary therapy while 7 had prior microsurgery.

Follow up status on hearing was available in 30 (78.9%) of 38 patients with pre GKRS preserved hearing. Functional hearing (could take phone call) was present in 67, 40 and 22 percent patients at less than 5-year, 5-10 year and more than 10- year follow up respectively. In 4 (13.3%) patients hearing improved or remained same as pre-GKRS level and in the rest, it had deteriorated to a variable extent. A total of 37.5% patients had preserved hearing at follow up. There was no malignancy.

**Conclusions:** GKRS has a high tumour control and hearing preservation rate thus making it an attractive alternative option in the management of small to medium sized vestibular schwannoma.

## Skull Base

Oral presentation

### Intracanalicular vestibular schwannoma – treatment management

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**Objectives:** *Vestibular schwannoma* (VS) is defined as *intracanalicular* (IC) when it is limited to the internal auditory canal. Treatment options include microsurgery, stereotactic radiosurgery such as Leksell gamma knife (LGN) and observation (wait and scan).

**Background:** The aim of the work was to evaluate the obtained data, compare them with the literature and to propose an optimal treatment procedure.

**Methods:** Retrospective analysis of a group of more than 1,000 patients treated at our department in the years 1998-2022. Endoscopically assisted microsurgery and perioperative monitoring of hearing and facial nerve (NVII) function were used. Several patients were only observed.

**Results:** There were 20% of patients with intracanalicular schwannoma in our group. In the case of patients with preserved hearing, the suboccipital retrosigmoid approach (RS) was most often chosen. Only a small number of tumors were operated by the translabyrinthine (TLB) approach (primarily patients with deafness or useless hearing). Postoperative magnetic resonance imaging showed no residue or recurrence of IC VS. In all cases of IC VS it was possible to preserve or restore good NVII function. Useful hearing was preserved in 13 %. In several cases, there was an improvement from useless to useful hearing. There was no development of postoperative tinnitus. Postoperative otoneurological examination in most cases showed good vestibular compensation. All patients returned to normal life. Most elderly patients, often with useless hearing, were only observed.

**Conclusions:** Treatment of IC VS must always be individual. In young patients, IC VS should be removed before a growing tumor destroys hearing. LGN leads to a gradual deterioration of hearing. It also attributes the results of the natural behavior of non-growing IC VS. In our opinion, LGN is not indicated in the treatment of IC VS. TLB approach always leads to hearing destruction. Therefore, for IC VS we prefer the RS approach.

## Spine

ePoster presentation

### Risk factors for unfavorable outcomes in the surgical treatment of non-specific spondylitis and spondylodiscitis

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**Objectives:** To evaluate the results and identify risk factors for unfavorable outcomes in surgical treatment of patients with primary spondylitis and spondylodiscitis.

**Background:** In our healthcare system, surgical treatment of the spondylodiscitis is carried out by neurosurgeons or very rarely by orthopedic surgeons, who are mainly carry out treatment of spondylitis and spondylodiscitis of tuberculous etiology. We believe that the combination of neurosurgeon and purulent surgeon experience is a prospective line in the treatment of the non-specific spondylitis and spondylodiscitis.

**Methods:** This retrospective study included 56 patients with primary nonspecific inflammatory diseases of the spine. The severity of the spondylitis and spondylodiscitis was classified using the E. Pola scale. The debridement of the purulent focus was performed using three **Methods:** posterior paramedian approach with laminotomy; retroperitoneal o retropleural approach; percutaneous transpedicular puncture of the intervertebral disc with placement of a drainage system.

The results were assessed using the VAS scale and Karnofsky Score.

**Results:** Excellent results were obtained in 23 (41%) patients (the patient is fully active, able to carry on normal activity as before the surgery, Karnovskii score – 80-100 , moderate disability – in 17 (30%) patients (the patient is able to care for most of his/her personal needs, Karnovskii score – 50-70 ), deep disability – in 9 (16%) (the patient is not able to care for most of his/her personal needs, care and assistance are required, Karnovskii score – 10- 40). Postoperative lethality was 12.5% (7 patients died).

**Conclusions:** Knowing the risk factors for unfavorable outcomes in surgical treatment of primary spondylitis and spondylodiscitis, as well as using the experience of neurosurgeons and purulent surgeons, allows optimizing the strategy, improving treatment outcomes and reducing the number of recurrences.

## Skull Base

Oral presentation

Vestibular schwannoma: failure of the partial resection and stereo radiosurgery

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**Objectives:** Vestibular schwannoma can be removed completely and the patient be cured for life, or partially, requiring further treatment.

**Background:** Aim of this work is to assess whether there is a difference in results between primary total removal of vestibular schwannoma (VS) and totally removed tumors after previous subtotal/partial resection and unsuccessful stereoradiosurgery (SRS) by Leksell gamma knife.

**Methods:** Results and complications were compared in 2 groups of patients treated during 1997- 2022: primary radical removal of VS (n= 700), and radical removal following partial surgery and/or gamma knife SRS failure (n=13). Follow-up 1 – 24 years.

**Results:** Almost 90% were large Grade III and IV tumors. All patients underwent removal nearly by same team and retromastoidal approach with intraoperative neuromonitoring.

In case of primary treatment we achieved radical removal in 99% and anatomical preservation of n. VII in 97% with House-Brackmann I-III n. VII function in 87%. We spared useful hearing in 73% of preoperatively useful hearing ears. Most of the patients returned to previous social activities. In case of surgery after partial resection and SRS failure it was extremely difficult to achieve radical removal. Satisfactory function of n. VII was achieved in 9% only without chance of hearing preservation. Further neurological deficits were common and led to invalidity of such patients. Viable and proliferating tumor cells were proved histologically in all tumors after SRS.

**Conclusions:** Growing VS should be treated by primary radical microsurgery by retromastoidal approach. SRS by Leksell gamma knife did not prove to be effective alternative to microsurgery in patients in whom the initial microsurgical removal failed.



## Skull Base

Oral presentation

Jugular foramen schwannomas. Long term results

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**Objectives:** The aim of our study is to present long-term results of microsurgically treated JFS and to contribute to optimal treatment.

**Background:** Jugular foramen schwannomas (JFS) represent rare tumors of the skull base. Less than several hundred cases of JFS have been reported in the literature. No consensus exists on their management (watchful waiting, microsurgery or stereoradiosurgery).

**Methods:** All data of consecutive patients microsurgically treated for JFS were analyzed retrospectively. All tumors were radically removed in one or two session. Operative approach (transcervical, transtemporal, retrosigmoid and combinations; mostly in one stage) was chosen according to the type of the tumor (A,B,C,D) according to Kaye et al. (1984) and Pellet et al. (1988) . Intraoperative monitoring of evoked potentials helped us to reduce the risk of injury to the neural structures. Each patient was carefully monitored before, during and after the surgery. Five of those 27 patients were unsuccessfully treated before the microsurgery by several different methods including the stereoradiosurgery by Leksell Gamma Knife (LGK).

**Results:** Our post-operative follow-up of 27 patients observed for up to 39 years did not show any mortality, just temporal or tolerable lesions of cranial nerves IX, X, XI, and only two tumor recurrences 11 and 14 years after the first surgery. These were successfully reoperated.

**Conclusions:** The microsurgical radical removal of jugular foramen schwannomas seems to be superior to all other methods of treatment including the LGN surgery.

## Neurovascular Surgery

Oral presentation

Using computational flow dynamics to predict risk of aneurysmal rupture: a retrospective analysis of a 15-year database of cerebral aneurysms

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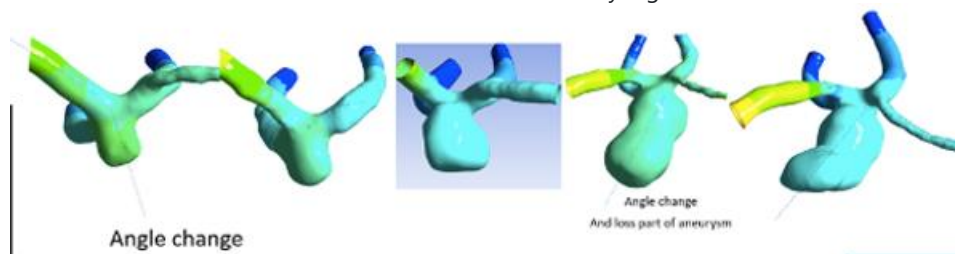
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**Objectives:** We explored the role of computational flow dynamics data in predicting the risk of rupture of cerebral aneurysms under surveillance. We present data from a 15-year aneurysm database at a large Australian tertiary center with a 1 million-population catchment.

**Background:** Current prediction models attribute great significance to aneurysm size at presentation as a predictor of rupture. However, 41.4% of ruptured aneurysms in our 1450 aneurysm database were <7mm in size at time of rupture, prompting an investigation into the role of flow dynamics. In cerebral aneurysms, direction of blood flow and constant re-circulation results in wall shear stress, leading to a focal area of energy loss in the aneurysmal wall. We used this model to analyze risk of rupture of aneurysms under surveillance.

**Methods:** Six investigators established an aneurysm database between 2007 and 2022 at a single large tertiary center. We analyzed aneurysms that increased in size or ruptured under surveillance. Computational flow dynamics derived from wall energy loss (EL) and aspect ratio of the aneurysms were analyzed. We used the same modality of imaging when assessing interval changes in aneurysmal flow dynamics.

**Results:** 1450 aneurysms were identified in our database. 68 aneurysms increased in size under surveillance of which 73% fell in the critically high-risk zone of rupture based on computational flow, and 79.5% demonstrated progressive EL. A change in flow angle was demonstrated as aneurysms increased in size (see diagram). Nine aneurysms ruptured whilst under surveillance, of which 63% fell in the critically high-risk flow zone at time of rupture.



**Conclusions:** Whilst the size of aneurysms is a key risk factor for rupture, interval increase in size and flow dynamic changes, including EL and change of blood flow direction may play a more important role in predicting risk of rupture.

## Neurovascular Surgery

ePoster presentation

### Surgical treatment of vascular lesions in foramen magnum

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**Objectives:** I discuss the treatment options to management of vascular lesions in foramen magnum, especially lesions of anterior spinal artery. Far lateral approach is the best method to treat aneurysms and AVMs of the anterior spinal artery.

**Background:** Vascular lesions arising from anterior spinal arteries are very rare. Rupture of an anterior spinal artery aneurysm or AVM is a rare cause of subarachnoid hemorrhage accounting for less than 1% of all cases reported in the literature. The management options include a surgical approach, endovascular embolization, or conservative treatment. Endovascular treatment with embolization using coils or liquid embolic agents is very difficult to reach to the aneurysm and to preserve parent artery and very dangerous risk of medullar infarction result in quadriparesis. So the surgical approach is usually employed in aneurysms of anterior spinal artery and AVM. Far lateral approach is useful method to approach to the origin of anterior spinal artery and manage the aneurysm and AVM.

**Methods:** We experienced 3 cases of ruptured anterior spinal artery aneurysms and 2 case of ruptured AVM.

**Results:** All patients presented SAH Fisher grade 2. And clinically H-H grade 2 and 3. And successfully treated surgical managements, one clipping, two wrapping of aneurysms, 2 removal of AVMs, via far lateral approach. No patients presented newly developed postoperative neurologic deficit.

**Conclusions:** Far lateral approach is useful method to approach to the origin of anterior spinal artery and manage the aneurysm and AVM. We successfully surgically treated ruptured aneurysms, and AVM arising from anterior spinal artery with far lateral approach.

## Peripheral

ePoster presentation

Anterior transposition of the radial nerve to achieve primary suture for its reconstruction: anatomical feasibility study

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**Objectives:** The aim of this study was to investigate the maximal nerve defect size in the area of spiral groove, that can be treated with anterior transposition of the radial nerve in two positions of the elbow - extension and 30 degrees flexion.

**Background:** Radial nerve palsy after humeral shaft fractures is often associated with neuroma formation. The current standard treatment is neuroma resection and nerve grafting with contentious results. Transposition of the radial nerve anteromedially may shorten the nerve path since it descends anteriorly in the forearm and creates the opportunity of primary suture.

**Methods:** On ten arm specimen from five fresh cadavers, the radial nerve was dissected in the posterior septum and at the anterior aspect of the forearm. Radial nerve was then transected at the level of the spiral groove and both stumps were transposed to the medial septum. The length of the stumps overlap was measured in full elbow extension and 30 degrees flexion.

**Results:** The average length of the distal and proximal stump overlap at zero degrees of elbow flexion was 10.00mm ± 1.84. Calculated defect size potentially treatable by primary suture was 20.00mm ± 3.69 SD. Adding 10% of possible nerve length stretch the defect size increases overall to 29.87mm ± 2.22. At 30 degrees elbow flexion the potential defect size was even higher (30.4 mm ± 4.96, + 10% 49mm ± 4.25).

**Conclusions:** We proved, that anterior transposition may be the solution of the radial nerve defects in average length up to 5cm. Despite all the advantages, dissection of both stumps is challenging and must be provided meticulously.

## Trauma

ePoster presentation

### Presentation, management, and outcomes of adult and pediatric traumatic brain injury in rural Kenya

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**Objectives:** Describe the presentation, management, and outcomes of patients with traumatic brain injury (TBI) at AIC Kijabe Hospital, a 340-bed non-profit hospital in rural Kenya without a full-time neurosurgeon. Assess change in Glasgow Coma Scale (GCS) through admission and describe association with outcome.

**Background:** TBI is a major challenge in sub-Saharan Africa, but data on epidemiology and management outside of the national referral centers are limited.

**Methods:** Prospective single-center cohort study at Kijabe November 2021-May 2023. All children and adults with TBI were consecutively enrolled within 24hrs of admission. Demographic, laboratory, radiographic, mortality, and management data were obtained from the electronic medical record. Study staff assessed GCS upon enrollment, 24-48hrs later, and at discharge.

**Results:** Overall, 15 children and 77 adults were enrolled (N=93). Median age was 32 years (IQR 24-43); the majority were male (n=69, 74%). Road traffic accidents were the most common cause (n=61, 66%). Twenty-one (23%) patients had severe TBI (GCS 3-8), 11 (12%) had moderate (GCS 9-12), and 61 (66%) had mild (GCS 13-15) upon admission. Of those with severe TBI, 9 (43%) received hyperosmolar therapy, 18 (86%) had an admission CT head, 11 (52%) received anticonvulsants, 8 received tranexamic acid (38%), and 3 (14%) received a burr hole or craniotomy. GCS worsened 24-48 hours after admission in 8 patients with severe TBI (38%) but in only 3 patients (4.2%) with moderate or mild TBI. Of the 8 patients with severe TBI whose GCS worsened, 100% (n=8) died during hospitalization. Overall, 12/90 patients died during hospitalization (13%), 11 of whom (92%) had severe TBI.

**Conclusions:** In this hospital, mild TBI occurs frequently and mortality is low. Patients with severe TBI received variable management and had high mortality if GCS worsened after admission. Future research should focus on long-term TBI outcomes and strategies to improve survival after severe TBI in resource-variable settings.

## Endovascular Neurosurgery

Oral presentation

Metallic artifact reduction angiogram versus digital subtraction angiography for the evaluation of occlusion of intracranial aneurysms after endovascular management

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**Objectives:** To compare the accuracy of metallic artifact reduction angiogram (CTAMaR) and digital subtraction angiography (DSA) for the evaluation of occlusion of intracranial aneurysms after endovascular management with coils.

To determine the number of cerebral aneurysms treated at the José Eleuterio González University Hospital (HU) during 2018 and 2019.

**Background:** Intracranial aneurysms affect about 2% of the general population.

Endovascular embolization with coils is used to treat acute subarachnoid hemorrhage and unruptured aneurysms.

Image follow-up is necessary and the DSA has been considered the "gold standard". Over time, time-of-flight MRA and other alternative techniques will replace DSA. In some cases, MRA is not an option, so (CTAMaR) is considered as a viable alternative for monitoring coil-embolized aneurysms.

**Methods:** Retrospective study in patients with intracranial aneurysms treated by coil embolization at the José Eleuterio González University Hospital (HU) in 2018 and 2019, who underwent CTAMaR and DSA for follow-up after embolization. The images were independently analyzed by two Neuroradiologists and two Endovascular Neurosurgeons. The observers agreed and K statistics were used to calculate the Cohen coefficient.

**Results:** 66 patients were treated in 62 coil embolizations between 2018 and 2019. After the exclusions, 12 image pairs formed the study group.

In 92% of the compared images, the results of the CTAMaR and the DSA coincided.

The sensitivity and specificity of the CTAMaR were calculated, which were respectively 100% and 75%.

**Conclusions:** This study suggests that CTAMaR is a safe and valuable method for monitoring coil-embolized cerebral aneurysms. This technique is as accurate as DSA in the evaluation and detection of recanalization of coil-embolized aneurysms.

## Global Neurosurgery

ePoster presentation

Global neurosurgery: fulfilling the unmet need through productivity enhancement

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**Objectives:** 1. Demonstrate that neurosurgical productivity varies greatly – and that training more neurosurgeons without productivity enhancement is not the most efficient way to address the unmet global need.  
2. Provide specific examples of how individual neurosurgeons can improve productivity by employing evidence-based medicine.

**Background:** Approximately 50% more neurosurgeons than the current 50,000 worldwide – 23,000 – are necessary for the unmet need, primarily in low- and middle-income countries (LMICs).<sup>1</sup>

In Europe the average number of operations per neurosurgeon annually ranges from 56 to 300 depending on the country.<sup>2</sup> Increasing the productivity of “underperforming” neurosurgeons can address the unmet need.

<sup>1</sup> Dewan MC et al. J Neurosurg 130:1055-64, 2019

<sup>2</sup> Reulen H-J et al. Acta Neurochir 151:715-21, 2009

**Methods:** Productivity limits are typically: (1) procedure-related; (2) infrastructure-related. The neurosurgeon can control the former, the latter requires interaction with other healthcare personnel (e.g. anesthesiologists, hospital administrators). The former requires education of neurosurgeons; the latter is largely site-specific (i.e. solutions addressing local infrastructure “weak links”).

**Results:** Several procedure-related points that increase productivity:

1. Not shaving prior to surgery (unless scalp trauma). This decreases infection risk, saves time (a) prior to surgery, (b) after surgery (no or minimal dressing required), (c) post-op (patients with hair intact feel less “disabled”, mobilize more rapidly).
2. Making incisions parallel to scalp arteries. Time applying/removing Raney clips is obviated.
3. Replacing many ventriculoperitoneal shunts with either third ventriculostomies (obstructive hydrocephalus) or lumboperitoneal shunts (communicating hydrocephalus). Surgery time is typically shorter, with fewer time-consuming complications long-term.
4. The neurosurgeon constantly assessing his/her surgical “habits” for more efficient techniques.

Infrastructure-related limits on productivity would benefit from courses by neurosurgeons who have been successful interacting with their healthcare system to improve productivity.

**Conclusions:** Neurosurgeon productivity can be enhanced through addressing inefficient “surgical habits” and improved interaction with the healthcare infrastructure.

## Oncology

ePoster presentation

Human patient-derived organoids as a tool to study cytotoxic treatment effects on glioblastoma cells and their microenvironment: a technical note

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**Objectives:** Human patient-derived organoid models of glioblastoma have emerged as a powerful tool in cancer research.

**Background:** By avoiding clonal selection and preserving the tumor's local cytoarchitecture, these three-dimensional glioblastoma organoids (GBOs) provide a more physiologically relevant platform for studying the heterogeneity of cancer cells, tumor-stroma interactions and drug responses. GBOs might also provide an opportunity to study the effects of radiotherapy on cancer cells and the surrounding microenvironment.

**Methods:** In a first step, a human GBOs were successfully established, using fresh tumor material derived from neurosurgical resection performed at the neuro-oncological center of the University Hospital Bonn. Subsequently, these GBOs were treated with the standard chemotherapeutic agents temozolomide and lomustine, commonly employed in glioblastoma therapy. To comprehensively investigate the effects of chemotherapy on cell death and tumor cytoarchitecture, novel protocols for flow cytometry, two-photon imaging and lightsheet imaging were created and implemented.

**Results:** Following the successful generation of GBOs we optimized the culturing conditions resulting in their ability to be maintained in culture for an extended period of up to six months. In addition, the establishment of a GBO biobank facilitated the cryopreservation and subsequent revival of GBOs, ensuring their long-term availability. To reliably assess cell death, a refined protocol for flow cytometric analysis utilizing propidium iodide was developed, affirming the validity of GBOs as a robust tool for evaluating the effects of chemotherapeutic agents. Furthermore, the implementation of two-photon imaging techniques and lightsheet imaging enabled the elucidation of alterations in the cytoarchitecture of GBOs and the network morphology of tumor cells.

**Conclusions:** GBOs are a valid model to study the impact of chemotherapeutic agents on cell death and tumor morphology. It further indicates that GBOs might also be powerful model to assess the effects of different regimes of radiotherapy on glioblastoma cells and the surrounding microenvironment.



## Oncology

ePoster presentation

### Calvarial hyperpigmentation

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**Objectives:** Report a rare case of calvarial hyperpigmentation.

**Background:** Osseous hyperpigmentation of the skull is an extremely rare finding with only five reported cases in the literature to date. All cases reported only involve the outer cortex with our case being the only case to date with involvement of the outer cortex, diploe and inner cortex.

**Methods:** Case report.

**Results:** The case is of a 59-year-old caucasian male who presented with an acute history of generalized tonic clonic seizures and progressive weakness of the right upper limb. He had a background history of a malignant melanoma which had been resected from his left external acoustic meatus four weeks prior. Neuroimaging of the brain showed an intra-axial space-occupying lesion in his left parietal lobe with no associated osseous changes. A left mini parietal craniotomy was performed which revealed black discoloration of the parietal bone. The discolouration involved all layers of the parietal bone, a phenomenon which has not previously been reported in the literature to date. The lesion was successfully resected and the bone flap was secured back in place. The patient was discharged on the fourth day postoperatively with no complications. The unusual finding of black discoloration of the calvarium was found to be secondary to adolescent tetracycline use.

**Conclusions:** Calvarial hyperpigmentation is a rare phenomenon encountered incidentally and will often come as surprise for surgeons. Once encountered, thorough history taking and examination should be done to investigate the cause.

## Oncology

ePoster presentation

### First report of meningiomas frequency in Mozambique

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**Objectives:** The purpose of this work is to identify the frequency of meningiomas in the Maputo Central Hospital from 2013 to 2017.

**Background:** Meningiomas are the most frequent brain tumour, representing about a third of all primary tumours. they are usually benign lesions and if treated properly with a good prognosis, they are much studied in high and middle income countries, but in sub-Saharan Africa there is still a lack of studies and this is the first work on this topic in Mozambique.

**Methods:** A retrospective cohort study was performed; Inclusion criteria were age over 18 years, histological comparison of the diagnosis. Only surgical cases where included.

**Results:** From 2013 to 2017, 62 patients were diagnosed with a brain tumor and of these, 70% (44) had meningiomas. 51% of the patients were female and the mean age was 35 years, and the most frequent histological type was psammatous - 36%.

**Conclusions:** The present work identified a frequency of meningiomas within the expected range, but in a much younger population than reported in the literature, probably due to the fact that the country's population is also very young.

## Oncology

Oral presentation

Inhibition of intercellular communication via gap junctions renders medulloblastoma cells more susceptible for cytotoxic therapy

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**Objectives:** Intercellular communication is considered a major hallmark of chemotherapy resistance in malignant brain tumors. Connexin-43-based gap junctions (GJs) may add to this communication system by facilitating intercellular ion transfer and small molecule exchange.

**Background:** The impact of GJs in medulloblastoma as the most common malignant pediatric brain tumor is unknown. In the present study, we analyzed the potential of GJs as a putative novel therapeutic target in medulloblastoma.

**Methods:** Immunofluorescence and Western blot analysis for connexin-43 were used to evaluate intercellular GJ expression in human group 3 and 4 medulloblastoma cell lines. A CRISPR/Cas9 gene knockdown of connexin-43 was used to explore cellular effects related to the inhibition of GJs. Realtime-imaging fluorescence-guided measurements of GJ-mediated cell-to-cell cytoplasm transfer were performed for the CRISPR/Cas9 connexin-43 knockdown model and meclofenamate (MFA) treatment. We used RNA-sequencing to study downstream signalling cascades in response to GJ inhibition. Cell death rates were assessed by flow cytometric analysis of propidium iodide-stained nuclei.

**Results:** All medulloblastoma group 3 and 4 cell lines showed a high expression of intercellular connexin-43-based GJs. We observed a significant reduction of intercellular cytoplasm transfer via GJs in both the CRISPR/Cas9 connexin-43 knockdown model and in MFA-treated medulloblastoma cells. MFA-mediated inhibition of GJs profoundly rendered medulloblastoma cells susceptible for lomustine-mediated cell death. Cytotoxic effects were similar to those observed in CRISPR/Cas9 connexin-43 cells. Gene set enrichment analyses revealed GJ inhibition to induce elevated levels of programmed cell death induction in combination with lomustine treatment.

**Conclusions:** The present study suggests inhibition of intercellular cytosolic traffic via GJs to render medulloblastoma cells more susceptible for lomustine-induced cytotoxic effects. GJ-targeted approaches might constitute a novel treatment strategy for malignant pediatric brain tumor. With regard to observed GJ-inhibitory effects of MFA as a FDA-approved drug, these findings might entail a direct translational impact and enable further investigations in a clinical setting.

## Endovascular Neurosurgery

ePoster presentation

Woven EndoBridge (WEB) embolization in small, shallow unruptured bifurcation cerebral aneurysms

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**Objectives:** The purpose of this study was to evaluate the feasibility and efficacy of the WEB device in small, shallow bifurcation aneurysms.

**Background:** The shallow aneurysm that has a short aneurysm height (under 2.5mm) is difficult to treat with WEB device.

**Methods:** Patients with aneurysms treated with the WEB device were evaluated retrospectively. The technical feasibility, procedural complications, and clinical outcome were studied in small shallow aneurysms.

**Results:** Fifteen patients and aneurysms treated with the WEB device were included. The mean aneurysm size was  $6 \pm 2.9$  mm. Aneurysm locations were the following: anterior communicating artery (9 patients), MCA (3 patients), and basilar tip (3 patients). Four cases were small, shallow aneurysms. The WEB devices were successfully delivered in all cases. Two patients changed WEB size. Two patients suffered embolic infarction within 1 month, but, there were no permanent deficits. Short-term angiographic complete occlusion was obtained in all cases.

**Conclusions:** Aneurysm embolization with the WEB device appears technically feasible and effective for the treatment of unruptured wide neck bifurcation aneurysms, even in small shallow aneurysms. However, beginners should be better to try easy cases considering the deviation of the aneurysm axis to the inlet flow line and aneurysm height.

## Hydrocephalus

Oral presentation

### Sexual dimorphism in a rat model of hydrocephalus induced by extraparenchymal neurocysticercosis

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**Objectives:** We aimed to investigate the sexual dimorphism of inflammatory responses in a rat model of neurocysticercosis-induced hydrocephalus caused by *Taenia crassiceps*.

**Background:** Neurocysticercosis is a heterogeneous disease, and the patient's sex seems to play a role in this heterogeneity. Hydrocephalus is one of the most devastating complications of neurocysticercosis, with high rates of mortality and disability. Clinical observation has shown that women present more intense inflammatory responses than men. We developed an experimental model of extraparenchymal neurocysticercosis. Upon this model, laboratory settings can help understand clinical challenges.

**Methods:** We used Wistar rats (25 females, 22 males). Inoculation was performed at the occipito-cervical transition, towards the cisterna magna, with 50 viable *Taenia crassiceps* cysts. Ninety days after the inoculation, the rats were euthanized for histologic, immunohistochemistry, cytokines, and magnetic imaging studies. Morphometric analysis was performed to quantify immune cells in the basal arachnoid and periventricular regions. Glial fibrillary acid protein (GFAP) expression level was estimated by immunohistochemistry to evaluate astrocytes' activation within the periventricular zone (PVZ). IL-6, IL-10, and interferon-gamma (IFN- $\gamma$ ) levels were quantified in the homogenized solution of brain tissues using the sandwich ELISA technique. MRI was performed using 7T equipment with a T2-TSE sequence.

**Results:** The ratio of lymphocytes/ $\mu\text{m}^2$  was higher among female than male rats in the arachnoid ( $p=0.023$ ), but there was no significant difference in the PVZ. The ratio of reactive astrocytes in the PVZ was also higher in the female group ( $p=0.001$ ). A significantly higher level of IL-6 and IL-10 was observed in females than in males. The numerical mean level of IFN- $\gamma$  was also higher in females, but the difference was not statistically significant. On MRI, marked ventricle enlargement was observed in 40% of males and 60% of females.

**Conclusions:** Inflammatory responses were more severe in female than male rats with experimental neurocysticercosis-induced hydrocephalus.

## Epilepsy

Oral presentation

Surgically remediable epilepsy syndromes in neurocutaneous disorders - a case series from a comprehensive epilepsy care centre

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**Objectives:** Evaluation of the rare yet distinctive association of Neurocutaneous disorders (NCD) with surgically remediable epilepsy syndromes (SRES)

To also study the associated epilepsy surgery outcomes

**Background:** In NCDs, the concept of SRES is less explored and imperfectly understood. Unique pathophysiologies and natural histories that are drug resistant, compel an early pre-surgical work up for surgical candidacy even in SRES associated with NCDs, albeit with special challenges. The disparate spectrum of seizurogenic lesions in NCDs and their multiplicity, makes surgical candidacy decisions more formidable.

**Methods:** We retrospectively reviewed the clinical profile, pre-operative work-up with radiological imaging and treatment outcomes of patients with neurocutaneous disorders who underwent epilepsy surgery from 1995-2021 at our comprehensive epilepsy care centre.

**Results:** Out of 2461 epilepsy surgery procedures done during the study period, 19 patients (0.77% of the total epilepsy surgeries) with neurocutaneous disorder (NCD) associated surgically remediable epilepsy, underwent resective/disconnective surgery with a curative intent. These included 6 patients with Tuberous sclerosis, 5 with Sturge Weber syndrome, 6 with neurofibromatosis type 1 and 2 with Hypomelanosis of Ito. The mean duration of epilepsy in these patients was 13.05 years (S.D. 10.25). The surgical spectrum included lesionectomies (4), extended lesionectomies (1), unilobar resections (10), multilobar resections/post quadrant resections (3) and functional hemispherotomy (1). Chronic invasive EEG monitoring was done in 2 patients (10.5%) prior to resections. Engel class I outcome was noted in 12 patients (63.15%) at a mean duration of follow up of 68.16 months (SD 41.1) and one patient had a major surgical adverse event.

**Conclusions:** Multiple epileptogenic lesions, diffuse ictal onset and unique epileptogenic networks make decision making for epilepsy surgery in neurocutaneous disorders very challenging. Neurofibromatosis type 1 associated SRES had better outcomes than tuberous sclerosis, Sturge-Weber and Hypomelanosis of Ito associated SRES. Surgical outcomes from a seizure outcome and adverse event profile perspective are satisfactory, in a carefully selected subset of patients with epilepsy associated with NCDs.

## Trauma

Oral presentation

### Traumatic brain injury and skull fractures in Mozambique

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**Objectives:** The objective of the present study is to clinically and epidemiologically characterize patients who were victims of traumatic brain injury (TBI) in the largest hospital in Maputo, capital of Mozambique, focusing mainly on depressed fractures, which were the most frequent diagnosis.

**Background:** Mozambique is a country in sub-Saharan Africa with 31 million inhabitants, and few tertiary hospitals with neurosurgical care.

Traumatic brain injury (TBI) along with the associated poor prehospital care is an important cause of mortality and disability. There are many limitations to the available diagnostic tools, including shortage of computed tomography (CT) scanners; additionally, hospitals have a dearth of intensive care unit (ICU) beds.

**Methods:** A retrospective cohort study was carried out on the characterization of patients with TBI in a tertiary hospital in Maputo - Mozambique from 2018 to 2019, focusing on depressed fractures.

**RESULTS:** During the two years of the study there were a total of 1728 TBI patients, of which 354 had skull fractures, the main mechanism of trauma was road accidents, one-third of patients had severe TBI. Most patients were male and most depressed fractures were exposed.

**Results:** During the two years of the study there were a total of 1728 TBI patients, of which 354 had skull fractures, the main mechanism of trauma was road accidents, one-third of patients had severe TBI. Most patients were male and most depressed fractures were exposed.

**Conclusions:** TBI is one of the main causes of death in Mozambique as well as in other African countries. this work has the limitation that half of the time we did not have access to the CT scan, therefore we only made the diagnosis of fractures without being able to diagnose brain injuries, we do not know of other previous works that show the poor reality of Mozambique in relation to TBI.

## Oncology

Oral presentation

### Drug repurposing of tonabersat as a potent gap junction inhibitor sensitizes primary glioblastoma cells for temozolomide

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**Objectives:** Connexin-43-based gap junctions are known to interconnect glioblastoma cells to a multicellular syncytial network.

**Background:** Gap junction-targeted therapies might provide an essential contribution to isolate cancer cells within the brain, thus increasing the tumor cells' vulnerability to chemotherapeutic agent temozolomide (TMZ). However, a clinical implementation has been restricted in default of clinically approved gap junction inhibitors, so far. Tonabersat (TO) has been extensively studied in the course of clinical trials for migraine therapy and is known to inhibit gap junction communication. In the present study, we explored the effects of TO as a gap junction inhibitor within preformed glioblastoma networks.

**Methods:** In order to quantify the extent of gap junction inhibition, realtime-imaging fluorescence-guided measurements of gap junction-mediated cell-to-cell cytoplasm transfer were performed. We used RNA-sequencing to study downstream signalling cascades in response to TO treatment. Cell death rates were assessed by flow cytometric analysis of propidium iodide-stained nuclei. A CRISPR/Cas9 gene knockdown of connexin-43 was used as a validation tool for cellular effects related to the inhibition of gap junctions.

**Results:** We observed a significant reduction of intercellular cytoplasm transfer via gap junctions in TO-treated glioblastoma networks. Pharmacological inhibition of gap junctions profoundly increased the percentage of TMZ-mediated cell death. TO-induced synergistic effects with TMZ were similar to those seen in connexin-43 CRISPR/Cas9 cells. Gene set enrichment analyses revealed gap junction inhibition to induce elevated levels of programmed cell death induction in combination with TMZ treatment.

**Conclusions:** Drug repurposing of TO sufficiently inhibited intercellular cytosolic traffic via gap junctions in glioblastoma and revealed a sensitizing effect for temozolomide-mediated cell death. These synergistic effects were reflected by gap junction-inhibitory effects of TO. With regard to its previous use in clinical trials for migraine therapy, TO might harbor the potential of bridging the idea of a gap junction-targeted therapeutic approach from bench to bedside.



## Oncology

Oral presentation

Outcome assessment of intraoperative radiotherapy for brain metastases: results of a prospective observational study with comparative matched-pair analysis

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**Objectives:** Intraoperative radiation therapy (IORT) is an emerging alternative to adjuvant external beam radiation therapy (EBRT) following resection of brain metastases (BM).

**Background:** The advantages of IORT include instant effect to prevent tumor regrowth, optimized dose sparing of healthy brain tissue and faster completion of BM treatment, allowing an earlier admission to subsequent systemic treatments. However, outcome data are limited.

**Methods:** A total of 35 consecutive patients, prospectively recruited within a study registry, who received IORT following BM resection at a single neuro-oncological center were evaluated for radiation necrosis (RN) incidence rates, local control rates (LCR), distant brain failure (DBF) and overall survival (OS) as long-term outcome parameters. The 1-year estimated OS and survival rates were compared in a balanced comparative matched-pair analysis to those of our institutional database, encompassing 388 consecutive patients who underwent adjuvant EBRT after BM resection.

**Results:** The median IORT prescription dose was 30 Gy calculated at the applicator surface. A 2.9% RN rate was observed. The estimated 1 year-LCR was 97.1% and the 1 year-DBF-free survival 73.5%. Median time to DBF was 6.4 (range 1.7-24) months in the subgroup of patients experiencing intracerebral progression. The median OS was 17.5 (0.5-not reached) months with a 1-year survival rate of 57.6%, which did not not significantly differ from the comparative cohort ( $p=0.55$  and  $p=0.82$ , respectively).

**Conclusions:** IORT is a safe and effective fast-track approach following BM resection, with comparable long-term outcomes as adjuvant EBRT.

## Oncology

ePoster presentation

### Survival of patients undergoing surgical resection of lung cancer brain metastasis and utility of different prognostic scales

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**Objectives:** We aimed to analyze the survival of patients undergoing surgical resection of lung cancer brain metastasis, including clinical factors related to the survival, and to compare it to the estimated survival on prognostic scales.

**Background:** Brain metastasis (BM) are among the most common intracranial tumors. Its most frequent primary focus is lung cancer. Treatment involve a combination of surgery, radiation therapy, chemotherapy, target and immunotherapy or best supportive care. Many published scales attempt to estimate the survival of patients with BM. Biomolecular data and the modern oncologic treatment with target and immunotherapy are often unavailable on a routine basis in developing countries and, therefore, their incorporation into recent prognostic scales may diminish the reliability of these scales for low- and middle-income (LMIC) countries.

**Methods:** This is a retrospective cohort of patients surgically treated for lung cancer brain metastasis in a Brazilian public hospital. We analyzed overall survival and the variables associated with longer survival. We also compared our patients' survival to the estimates of different prognostic scales.

**Results:** Fifty-five patients operated on between 2012 and 2022 were included. The mean survival was 9.3 (min-max: 0.2-76.5). On univariate analysis, the female sex was associated with longer survival. An improved postoperative Karnofsky performance status (KPS) was associated with longer survival. The median survival was not different between groups classified according to GPA-2008 ( $p=0.053$ ), Lung-molGPA-2017 ( $p=0.536$ ), and Lung-GPA-2021 ( $p=0.660$ ) scales. Using DS-GPA-2012, there was a difference between groups ( $p=0.021$ ). On a multivariate Cox-regression survival analysis, higher DS-GPA-2012 score and improved postoperative KPS remained significantly associated with longer survival.

**Conclusions:** Mean overall survival in this cohort was 9.3 months. Improvement in KPS after surgery was related to increased survival. DS-GPA-2012 was the prognostic scale with estimated mean survival most similar survival to this cohort and it may provide valuable information for patients and physicians in LMIC.

## Oncology

Oral presentation

Randomized, controlled trial of anterior temporal lobectomy versus gross total resection in newly-diagnosed temporal glioblastoma – the ATLAS trial protocol

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**Objectives:** With the discovery of cellular tumor networks in glioblastoma with evidence of communicating malignant cells far beyond the enhancing tumor tissue, the conception of supramarginal resection strategies has gained growing attention. Thus, supramarginal resection might provide superior long-term disease control.

**Background:** Known as an anatomically highly standardized neurosurgical procedure commonly performed in patients with pharmaco-resistant temporal lobe epilepsy, anterior temporal lobectomy (ATL) might constitute a paradigm for such supramarginal resection strategies in temporal glioblastoma surgery.

**Methods:** Based on previous retrospective studies suggesting ATL to result in a significant survival benefit compared to a conventional gross-total resection (GTR) approach, the authors designed a prospective, randomized (1:1) multicenter controlled trial aimed at evaluating ATL for a potential superiority compared to a GTR approach in patients suffering from glioblastoma located solely within the temporal lobe.

**Results:** Superiority will be defined as significant differences in the primary endpoint overall survival (OS) and non-inferiority regarding the co-primary endpoint quality of life. Secondary endpoints include progression-free survival, functional and neurocognitive outcome among others.

The trial will randomize 170 patients in 22 German and Austrian University centers over 3 years with a follow-up of 3 years after inclusion of the last patient. Assuming a prolongation of median survival time from 17 months to 27.5 months for the ATL approach and constant recruitment, this sample size provides a power of above 80% for the intended two-sided stratified log-rank test (level of 5%) to detect differences in OS between the arms

**Conclusions:** This trial funded by the German Cancer Aid harbors the potential to show superiority of ATL versus GTR in temporal glioblastoma surgery and may thus introduce ATL as the surgical approach of choice for isolated temporal glioblastoma.

## Neurovascular Surgery

Oral presentation

Trends in mortality and hospitalization due to spontaneous subarachnoid hemorrhage in Brazil

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**Objectives:** We aimed to determine the temporal trends in mortality and hospitalization due to spontaneous subarachnoid hemorrhage (SAH) in Brazil from 2011 to 2019.

**Background:** SAH has a significant impact on morbidity and mortality. The incidence in the world is estimated at 6.67 cases per 100,000 inhabitants. Most of the available population data come from high-income countries. Data from low- and middle-income countries is missing.

**Methods:** This is a population-based study including deaths and hospitalization data available from the Brazilian health system. Information regarding hospitalization and mortality due to SAH between 2011 and 2019 were collected. We used all the ICD-10 codes related to SAH, with SAH listed on the death certificates as underlying cause of death. For hospitalization data, we extracted data through the National Hospitalization Information System. Hospitalization and mortality rates were calculated taking into account the Brazilian population reported by the Brazilian Institute of Geography and Statistics. For trends analysis, we used jointpoint regression to assess the annual percent change (APC) as well as linear regression to determine the estimate of annual evolution (b).

**Results:** In the period, there were 45,664 deaths due to SAH. The mortality rate raised from 22.66 to 26.19/100,000 inhabitants. There was a significant increase in the mortality (APC=2.6, p=0.027 [95%CI:0.41-4.78]), with an annual evolution of 0.6% per year (b=0.62, p< 0.0001). There were 88,457 hospitalizations in the same period. The hospitalization rate had two deflection points and ranged from 44.29 to 50.72/100,000 inhabitants. The estimate of annual evolution was not significant (b=0.06, p=0.821 [C95%CI:-0.54-0.66]). In the Northeast region, the mortality rates had significant increase and, the hospitalization rates, significant decrease. The other regions had relatively stable rates.

**Conclusions:** There is a trend for increase in mortality rates related to SAH in Brazil without a correspondent increase in hospitalization. This situation requires attention from public health managers.

## Endovascular Neurosurgery

Oral presentation

### Safety and effectiveness of using dual antiplatelet in ruptured aneurysm: a case control study

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**Objectives:** We aim to evaluate patients with ruptured intracranial aneurysms for which a stent was used at the acute phase of rupture. We specifically investigated safety, clinical and imaging follow-up at 6 months follow-up.

**Background:** Ruptured aneurysms are typically treated with coils, or surgery. In certain situations, it may be deemed necessary to use a stent or flow diverter (FD) stent, imposing to acutely instate a double antiplatelet regimen (DAPT), putting the patient at risk of rebleeding, and limiting opportunities for subsequent surgery.

**Methods:** We included patients with ruptured aneurysm treated between January 2014 June 2022 with endovascular treatment (EVT). Aneurysm repaired with clipping was excluded. Univariable models were used to assess difference between patients treated with DAPT and stent, versus usual care.

**Results:** In our analysis, 166 patients were included, (n=110 females, 66.3%). Among them, 142 underwent standard EVT (coiling) without DAPT, and 24 patients underwent EVT+DAPT (Ticagrelor+Aspirin). The median delay between rupture and treatment in the EVT+DAPT group was 1.5 days (IQR: 1-3). The mean Fisher Grade was slightly lower in the EVT+DAPT group compared to the EVT standard group (3.5 +/- 0.9 vs. 3.8 +/- 0.5, Z=2.5, P=0.012). Vasospasm was significantly more common in the EVT standard group (n=49/144, 34%) than in the EVT+DAPT group (3/24, 13%), p=0.025. The ruptured aneurysm was successfully treated in all cases in both groups. The rate of periprocedural iatrogenic ischemia was slightly higher in the EVT standard group (n=14/144, 9.7%) compared to EVT+DAPT (n=2/24, 8.3%), P=0.59. The rate of iatrogenic hemorrhage was significantly higher in the EVT+DAPT group (n=1/24, 4.2%) than in the EVT standard group (n=0/144, 0%), p=0.014. At 6 months patients in the EVT standard group (n=120/140, 85.7%) had a significantly higher proportion of favourable outcome when compared to the EVT+DAPT group (n=19/24, 79.2%) p=0.007.

**Conclusions:** Acute instatement of DAPT for treating ruptured aneurysms appears not to be associated with a disproportionate risk of hemorrhagic complication, and seemed to reduce the risk of ischemic complication. Reasons for less favourable 6 months outcome in this subgroup will be presented at the conference.

## Neurovascular Surgery

ePoster presentation

### Management of unruptured intracranial aneurysms: retrospective analysis of a single-centre experience

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**Objectives:** We aimed to evaluate the clinical results of unruptured intracranial aneurysms (UIA) treatment depending on the therapeutic approach (observation, endovascular treatment or surgical clipping). Also to evaluate the existence of potential risk factors related to a poor outcome.

**Background:** Currently, UIA are a common finding, occurring in about 3% of the population throughout their lifetimes. The consequences of aneurysm rupture are dire, with high likelihood of significant morbidity and mortality. Most aneurysms do not rupture and patients harboring these lesions often remain asymptomatic. There are effective surgical and endovascular interventions to prevent rupture, but these procedures carry a risk of adverse complications.

**Methods:** Retrospective observational study of consecutive patients that underwent treatment in a single center (2002/2022) for pure incidental UIA. We excluded those with a history of previous subarachnoid hemorrhage. The sample was characterized according to demographic and clinical variables, aneurysms features, type of treatment and modified Rankin scale (mRS) at one year of follow-up.

**Results:** A total of 210 patients with 149 UIA were assessed in the present study. 34% did not have aneurysmal repair, 27% had open surgery, and 39% had endovascular procedures. At one year of follow-up, 1/81 (1.2%) of those treated with endovascular procedures, 4/57 (7%) of those treated with surgical clipping and 8/72 (11.1%) of those with observation presented poor clinical results (mRS  $\geq$  3). The [multivariate analysis](#) showed that age ( $P = 0.008$ ) and location of the aneurysm on the posterior circulation ( $P = 0.045$ ) were independent risk factors for a poor clinical outcome at one year of follow-up.

**Conclusions:** There was not statistical difference in clinical outcome among the different treatment modalities. Age and location on the posterior circulation are independent risk factors for a poor clinical outcome.

## Endovascular Neurosurgery

ePoster presentation

Initial experience of the Derivo Embolization Device (DED) for the treatment of unruptured intracranial aneurysms in regarding safety and technical success-ability

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**Objectives:** The objective of this study was to evaluate the early safety and technical success rate of the Derivo Embolization Device (DED).

**Background:** The Derivo Embolization Device (DED) is a novel flow diverter stent that provides increased x-ray visibility, an improved delivery system, and potentially reduced thrombogenicity.

**Methods:** We retrospectively analyzed all patients with unruptured intracranial aneurysms (UIAs) treated with the DED between 2022 and 2023 in our hospital. Procedural details, complications, and morbidity within 30 days after treatment, as well as technical success rate were evaluated.

**Results:** Implantation of the DED was attempted in 7 patients with 8 aneurysms. All aneurysms were located ophthalmic and P-com segments. The procedures were technically successful in all cases. In one case performed balloon angioplasty for the achievement of better wall apposition. There are no procedure-related complications, morbidity, and mortality.

**Conclusions:** Endovascular treatment of UIAs with the DED is associated with high procedural safety and success rates. DED has a great opening pressure for better wall apposition. However, more stiff characteristics of the stent compared to other flow diverters are a weakness.

## Global Neurosurgery

Oral presentation

Aetiology and diagnostics of paediatric hydrocephalus across Africa: a systematic review and meta-analysis

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**Objectives:** To identify the aetiological distribution and diagnostic methods for paediatric hydrocephalus across Africa.

**Background:** Previous research has shown an association between incidence of paediatric hydrocephalus and low-income level of country, and children from Africa are disproportionately burdened.

**Methods:** We included studies from any African country reporting on the distribution of hydrocephalus aetiology in children aged 18 years and younger. The proportions of postinfectious hydrocephalus, non-postinfectious hydrocephalus and hydrocephalus related to spinal dysraphism were calculated using a random-effect model. We also included a category for unclear cases. To examine regional variances, we considered World Bank classification income level and latitude of study site. Heterogeneity between studies was examined by subgroup and meta-regression analyses, considering study- and patient-level variables. To assess methodological quality, we applied critical appraisal checklists from the Joanna Briggs Institute. Diagnostic work up was assessed qualitatively.

**Results:** We included 38 studies from 18 African countries. The pooled proportion of postinfectious hydrocephalus was 28% (95% CI 22–36), non-postinfectious hydrocephalus was 21% (95% CI 13–30), unclear aetiology was 20% (95% CI 13–28), and related to spinal dysraphism was 16% (95% CI 12–20), with substantial heterogeneity. In meta-regression, a negative association between the frequency of postinfectious hydrocephalus and latitude of study site was found, indicating decreasing proportion of postinfectious hydrocephalus with increasing distance from equator. Further, we found positive association between postinfectious hydrocephalus and low-income level of country and a negative association between the proportion of postinfectious hydrocephalus and studies of low methodological quality.

**Conclusions:** Our findings suggest that postinfectious hydrocephalus is the most common cause of paediatric hydrocephalus in Africa and that it is associated with socioeconomic and geographical factors. For targeted preventive and treatment efforts to be optimal, there is a need for improved access to diagnostic services and increased consensus regarding hydrocephalus aetiological classification.



## Neurovascular Surgery

Oral presentation

From conservative to interventional management in treating unruptured intracerebral aneurysms

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**Objectives:** This study aims to identify characteristic patterns and potential predictors of unruptured intracranial aneurysms (UIA) that request revision of an initially conservative management strategy.

**Background:** Indication for treatment of UIAs depends on several factors, such as patient's age, previous medical history, UIA location and size. For some patients harboring UIAs initially managed noninvasively, treatment strategy may change to surgical or endovascular intervention during follow-up.

**Methods:** Out of n=1041 intracerebral aneurysms diagnosed between 2006-2022 in our institution, n=144 patients were identified initially aligned to conservative management. These cases were retrospectively reviewed for patient and UIA characteristics at diagnosis (such as patient age, comorbidities, previous medical history, potential risk factors, as well as UIA angioarchitecture, location, and size), and for a change in their treatment strategy (reason for change, time to intervention, modality of intervention).

**Results:** In n=10 out of 144 initially conservatively managed patients (6.9%) indication changed to microsurgical clipping (n=6) or endovascular embolization (n=4) after a median follow-up of 26 months (interquartile range, 8.5-64.5 months). Out of the n=10 patients with change of treatment strategy, indication for intervention was given by aneurysm growth (n=7), change in its configuration (n=2) or both (n=1). Overall median follow-up for the entire population was 24.5 months (interquartile range, 7.75-55.75 months).

**Conclusions:** The likelihood of later change to invasive UIA treatment is relatively low if initially a conservative treatment strategy was established and remains unpredictable. However, if it comes to a change in the treatment strategy, this is most often due to UIA growth over time. Therefore, conservatively managed UIA patients need to be followed with regular radiographical monitoring of the UIA.

## Functional

Oral presentation

Randomized, controlled phase 2a clinical trial: role of stem cell therapy in ischemic stroke: safety and feasibility. Celictus study

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**Objectives:** To assess the safety of the intracerebral injection of mesenchymal stem cells in the perilesional area caused by an ischemic stroke, in association with neurological rehabilitation. The presence of adverse effects in terms of additional neurological deficits or adverse events that deteriorate the prior functional status was evaluated. To evaluate the effectiveness on Rankin, NIHSS, Barthel, FIM, and SF12 scales.

**Background:** The aim of this study was to establish the role of stem cell intracerebral injection like a potential therapeutic agent for disability improvement following ischemic stroke combined with neurological rehabilitation.

**Methods:** 20 patients were included in 2 groups of treatment: Group A (7 patients recruited/analysed), Group B (6 patients recruited/analysed). Expanded adipose tissue stem cells (10 million/mL) were injected in 5 trajectories of 20 mm length each. 0.2 mL (2 million cells) were administered in each trajectory at the following coordinates: anterior, posterior, medial, lateral and central (superior and inferior), all infused in the transition zone between normal and ischemic tissue, through a neuronavigation-guided brain biopsy system.

**Results:** Three adverse events were observed in the Experimental Group (arrhythmia, epileptic seizure and chronic subdural hematoma). A high improvement in Rankin scale was obtained when comparing subjects in the Experimental Group before and after stem cell infusion, showing improvement from moderate to mild disability ( $p= 0.046$ ). Improvement was observed in most of the other scales in spite of no statistical significance.

**Conclusions:** The main objective of this study was achieved, showing the safety of intracerebral injection of allogeneic fat tissue-derived stem cells in association with neurological rehabilitation.

Intracerebral stem cell injection significantly decreased the degree of functional disability measured by the Rankin scale. The associated neurological rehabilitation possibly contributed to plasticity improvement in patients, making it a potential therapeutic agent to enhance long-term therapeutic effects of stem cell injection.

## Oncology

ePoster presentation

Investigation into the role of long non-coding RNAs in glioblastoma: exploring their potential as biomarkers and targets for therapy

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**Objectives:** We focus on long non-coding RNAs (lncRNAs) as biomarkers and therapeutic targets in glioblastoma (GBM).

**Background:** GBM is the most frequent primary astrocytoma characterized by aggressive growth and poor prognosis. Despite conventional therapy, the median survival of patients is only 15 months from diagnosis. Therefore, it is crucial to identify new biomarkers and therapeutic targets, which would allow for more effective treatment.

**Methods:** The study included 219 GBM patients and 29 intractable epilepsy patients. 77 RNA samples were sequenced, and the expression of 11 significantly dysregulated lncRNAs was validated in 188 specimens by RT-qPCR. Moreover, LINC00634 expression was upregulated in U251 and T98G cells; and the effect of upregulated LINC00634 expression on viability, migration, and clonogenicity was studied *in vitro*.

**Results:** Out of the 538 significantly dysregulated lncRNAs ( $P < 0.001$ ) identified by transcriptome sequencing, a panel of 10 downregulated lncRNAs (SNAI3-AS1, LINC00882, RFPL1S, MIR137HG, TTLL7-IT1, PWAR6, LINC00634, LINC00632, DGCR5, LINC00982) and 1 upregulated lncRNA BTN2A3P in GBM was validated by RT-qPCR in independent cohorts. Further, the upregulated LINC00634 expression in GBM cells led to a less diffuse growth pattern of derived GBMs *in vivo* compared with control cells. However, no significant effect on viability, migration, and clonogenicity was observed *in vitro*.

**Conclusions:** A significant dysregulation of lncRNAs was observed in GBM compared to non-tumor controls using both transcriptome sequencing and RT-qPCR and was confirmed also by analyzing the TCGA-GBM dataset. We also showed the possible effect of LINC00634 upregulation on the growth pattern of U251-derived GBM tumors *in vivo*. Our study shows that lncRNAs are dysregulated in GBM and could serve as promising diagnostic biomarkers in GBM as well as potential therapeutic targets.

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## Endovascular Neurosurgery

Oral presentation

Intra-aneurysmal contrast stasis during intraoperative digital subtraction angiography: a predictor of thrombosis of intracranial aneurysm remnant after clipping?

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**Objectives:** To analyse characteristics of intraoperative digital subtraction angiography (iDSA) in order to find predictors for spontaneous intracranial aneurysm (IA) remnant thrombosis.

**Background:** Routine use of iDSA after clipping leads to increased detection of IA remnants after microsurgical clipping. Spontaneous thrombosis of IA remnants after clipping is considered a rare phenomenon.

**Methods:** Treated aneurysms with intraoperative detection of an IA remnant after clipping were identified and subdivided into remnants undergoing spontaneous thrombosis and remnants with long-term patency and/or remnant growth. Angiographic features of iDSA were analysed and compared between the two groups. In addition, a systematic literature review performed to identify cases of spontaneous IA remnant thrombosis.

**Results:** Out of 37 intraoperative remnant aneurysms on 3D-iDSA, n = 5 cases underwent a spontaneous remnant thrombosis and remained occluded on long-term follow-up. In all 5 cases iDSA revealed stasis of the contrast agent until the late venous phase (mean  $6.8 \pm 0.79$  sec.). By contrast, in all cases with patent long-term IA remnant (n = 32) iDSA demonstrated early wash-out without stasis of contrast agent. Literature revealed n = 30 cases with spontaneous regression of an IA.

**Conclusions:** Spontaneous thrombosis of IA remnants after clipping is a rare but existing phenomenon. Very low-flow into an IA remnant on iDSA is indicated by 1) invisibility of the remnant in the arterial phase; 2) contrast enhancement of the remnant in the venous phase; and 3) prolonged persistence of IA remnant contrast enhancement after venous washout. These imaging findings seem to predict spontaneous remnant thrombosis and are associated with short- and long-term IA occlusion. Therefore, risky clip correction manoeuvres may be avoided in these patients.

## Neurovascular Surgery

Oral presentation

### Risk assessment of intracranial aneurysm remnants after microsurgical clipping based on 3D-digital subtraction angiography

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**Objectives:** We aim to identify risk factors for IA remnants after microsurgical clipping based on 3D-DSA imaging.

**Background:** Several factors (such as i.e. intracranial aneurysm (IA) size, location, rupture status, shape, or use of multiple clips) have been suggested to predict the risk of incomplete IA clipping. However, their assessment has been based on 2D- digital subtraction angiography (2D-DSA), which fails to detect >30% of remnants detected on 3D-DSA.

**Methods:** A consecutive series of 329 clipped IAs in 305 patients with 3D-DSA analyse immediately after clipping was evaluated for the presence of IA remnants. Multivariate regression analyses were performed to assess for potential risk factors on the odds of remnant presence.

**Results:** After clipping of 329 IAs, 76 aneurysm remnants were present based on 3D-DSA. Pre-treatment IA size was the only robust risk factor identified to be associated with the presence of remnants ( $p < 0.001$ ). However, multivariate regression analysis found no association for IA rupture status (subarachnoid haemorrhage) ( $p = 0.237$ ), IA localization ( $p = 0.11$ ), use of multiple clips ( $p = 0.07$ ), broad based IAs ( $p = 0.38$ ), IA shape ( $p = 0.77$ ) or IA calcification ( $p = 0.97$ ).

**Conclusions:** When assessed by 3D-DSA, the incidence of IA remnants after clipping is higher than reported in the literature. In our series of 3D-DSA based imaging, initial IA size is a robust independent risk factor for incomplete clipping, and these cases have to be followed closely.

## Neurovascular Surgery

Oral presentation

Combined microsurgical and endovascular intracranial aneurysm treatment – interdisciplinary experience with a true hybrid approach and systematic review of the literature

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**Objectives:** This study analyses indication and benefits of a true hybrid approach (tHA) that combines simultaneous endovascular and microsurgical procedures for treatment of IAs.

**Background:** Most intracranial aneurysms (IAs) can be treated either with microsurgical clipping or with endovascular techniques. In few cases, however, simultaneous treatment with both modalities in a hybrid operation room may be favorable.

**Methods:** All patients that underwent a true hybrid procedure for IA treatment between 2010-2022 in our institution were included. Demographic characteristics, neurological symptoms, pre-interventional treatments, pre- and peri-interventional angiographic findings, and postoperative clinical and radiological outcomes were analyzed. Results are discussed in the light of a systematic literature review on reported true hybrid procedures for IA treatment.

**Results:** In total, n=10 tHA were performed. Of these, coiling and concomitant decompressive craniectomy or hematoma evacuation was performed on n=6 occasions. In n=2 patients multiple IAs in different vascular territories were treated with different modalities in the same procedure. In n=2 patient intraoperative conditions did not allow for complete IA clipping and the remnant was immediately coiled in the same session. Furthermore, in one of these intraoperative thrombectomy was performed due to a newly formed occlusive thrombus. Review of the literature revealed n=9 papers comprising 58 IAs treated with a tHA.

**Conclusions:** Overall, the need for a tHA for IA treatment is rare and limited to highly selective cases. In our experience, the tHA has been most valuable in an emergency setting of ruptured IAs. Furthermore, tHA may also be considered in patients with multiple aneurysms in different vascular territories.

## Global Neurosurgery

Oral presentation

Advancements in technology enabling remote surgical teaching in low- and middle-income countries (LMICs)

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**Objectives:** Employing the most advanced technologies to implement, improve, and promote neurosurgical care and training standards in low and middle-income countries through remote surgical teaching and training sessions.

**Background:** Approximately five billion individuals in LMICs lack adequate access to essential surgical care, a fundamental requirement for human well-being. This inequity severely affects the quality of life and reduces life expectancy. Training of new generation neurosurgeons is of utmost importance to address this gap. Therefore, we initiated remote programs to teach and train neurosurgeons from LMICs.

**Methods:** In July 2020, Foundation for International Education in Neurological Surgery(FIENS) initiated the FIENS Global Visitor Professor Program, a webinar series to share featuring renowned experts' knowledge and insights with neurosurgeons from LMICs. Furthermore, we launched a virtual neurosurgical residency training program in collaboration with the Solidarity Bridge Neurosurgery and Neurology Institute(NNI) for Paraguay and Bolivia neurosurgical communities in December 2022. In Lincoln F. Ramirez Neurosurgery Operative Skills Laboratory, we set up an AV setup to connect and initiate remote microsurgery training for neurosurgeons and residents from LMICs.

**Results:** Since July 2020, the FIENS Global Visitor Professor Program has organized seven webinars on high-yield topics such as Traumatic Brain Injury, Peripheral Nerve Surgery, Pituitary Tumors, Spinal Cord Injuries, and Neurotrauma and reached out to many colleagues from LMICs.

In collaboration with NNI, UW faculty and alumni have offered eight lectures that cover key neurosurgical topics for over sixty colleagues from Bolivian and Paraguayan.

In addition, with live microsurgery training sessions, we have reached out to over 80 colleagues from four different countries: Lebanon, Turkey, Bangladesh, and Paraguay.

**Conclusions:** Technological advancement, including virtual programs and hands-on training sessions, can make big differences in LMICs and allow capable surgeons to learn, develop and function in state-of-art neurosurgery practice.

## Spine

ePoster presentation

### L5 spondylolysis: anatomical study comparing healed and unhealed lesions

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**Objectives:** The anatomy and pathogenesis of spondylolysis has been widely studied; however, the microanatomy of spondylolysis of the lumbar vertebra has not been well described.

**Background:** Lumbar spondylolysis occurs when there is a defect or stress fracture in the pars interarticularis. L5 vertebra involvement has been found in spondylolysis in roughly 90-97.3% of the cases examined. This lumbar pathology is commonly attributed as a cause of low back pain in children and adolescents and less often in adults.

**Methods:** Twenty dry bone specimens of healed and unhealed spondylolysis of the L5 vertebra were collected from human skeletal remains. Twelve L5 vertebrae were examples of unhealed spondylolysis and eight specimens exhibited a healed (i.e., bony fusion of the lesion) spondylolysis lesion. The specimens underwent macro and microanatomical analysis followed by CT and microCT imaging. Finally, selected healed and unhealed lesions were submitted for histological analysis using Mason Trichrome staining. The pars interarticularis of two L5 vertebrae without signs of healed/unhealed spondylolysis were evaluated histologically as controls.

**Results:** Of the 12 unhealed L5 pars defects, three were unilateral. Of the eight healed pars defects, all were unilateral and seven of these were on left side. One unilateral pars defect also had spina bifida occulta. Both on imaging and histological analysis, healed pars defects were only so superficially and not at deeper levels. Histologically, unhealed edges were made up of dense cortical bone while healed edges were made up primarily of trabecular bone.

**Conclusions:** Based on our anatomical findings, the so-called healed spondylolysis lesions, although externally fused, are not thoroughly fused internally. Moreover, the anterior and posterior edges of the unhealed spondylolysis lesions are irregular and show signs of long-term disarticulation. Taken together, these data suggest that such 'healed' lesions might not be as stable as the normal L5 pars interarticularis.



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## Spine

ePoster presentation

Nonoperative management of spinal cord compression by multiple myeloma: a case report

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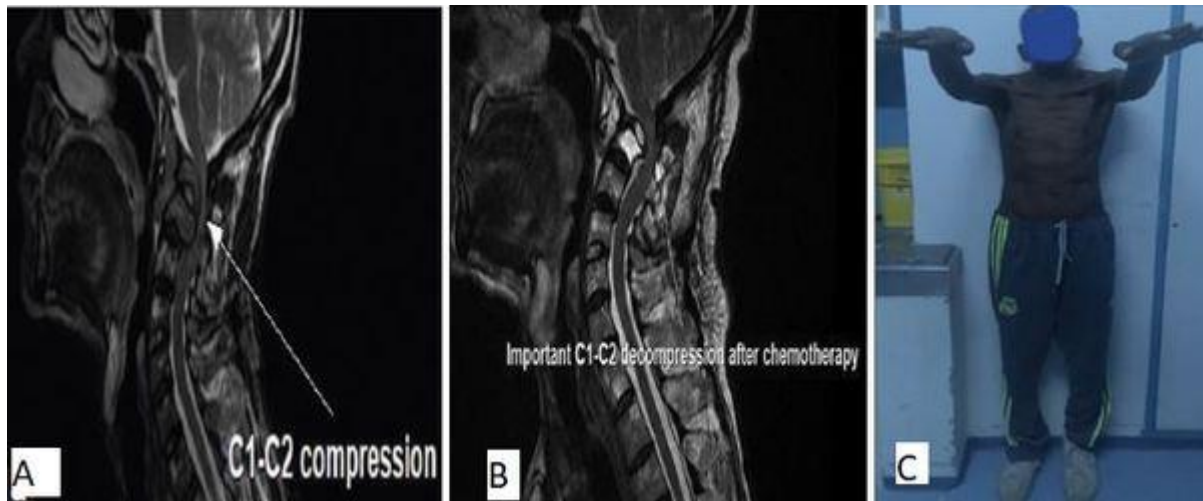
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**Objectives:** We report the case of a MM patient with spinal instability and SCC, who was successfully treated by nonoperative means.

**Background:** Spinal cord compression (SCC) is a devastating complication of multiple myeloma (MM). Surgical management is appropriate when there are spinal instability and neurological function compromise. The reversibility of peripheral neuropathy during treatment of MM has been reported in some studies after a cycle of Bortezomib (Velcade), Thalidomide, and Dexamethasone (VTD), but very rare in myeloma patients with SCC.

**Methods:** We report a case of a 58-year-old male tetraplegic secondary to cervical SCC by MM who completely recovered after 5 cycles of VTD chemotherapy and neck brace immobilization.

**Results:** Our nonoperative management in combination with chemotherapy has proven to be safe and successful, avoiding surgery and its complications.



**Conclusions:** Surgical spinal cord decompression by laminectomy is known as the gold standard for treating this condition. This study shows that neck brace immobilization combined with chemotherapy may have a role in the treatment of myeloma patients with mechanically unstable spines, acute SCC, and neurologic disorders.

## Neurovascular Surgery

ePoster presentation

### Development and implementation of an endovascular program in the Third World

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**Objectives:** Review the initial experience with endovascular treatment of ruptured aneurysms, highlighting outcomes- particularly the Raymond Roy Occlusion classification (ROCC) and the modified rankin score (mRS) at discharge.

**Background:** Guglielme et al were the first to successfully occlude intracranial aneurysms by the simultaneous application of electro thrombosis and electrolysis. At the University Hospital of the West Indies (UHWI), the definitive treatment for ruptured intracranial aneurysms was open microsurgical clipping. The endovascular program was successfully started in 2019. We present the initial experience of the endovascular treatment for ruptured aneurysms from 2019 to 2022 at UHWI.

**Methods:** Retrospective Data was collected from the endovascular database from January 2019 to June 2022.

**Results:** 21 treated cases of ruptured intracranial aneurysms were identified, 9 males (42.9%) and 12 Females (57.1%). The mean age of the population was 52.1 years. A total of 24 aneurysms were identified of which 21 were ruptured. The majority (90.5%) were anterior circulation and (9.5%) posterior circulation. The most common location of an aneurysm was the anterior communicating artery (Acomm) (47.6%) followed by Posterior communicating artery (Pcomm) (28.6%). 90.5 % of patients were Good Grade( Hunt and Hess I & II). No Patient had a re rupture prior to treatment. Average time to treatment .52.4 % underwent stent assisted coiling with no DAPT related haemorrhagic complications and 47.6% with coils only. 76.2 % of aneurysms had a Raymond 1 occlusion. The majority (76.2 %) of patients had a good outcome at discharge ( modified Rankin score 0-1).

**Conclusions:** Most patients were good grade with high aneurysm rate of complete occlusion and good outcome at discharge. We had a significant number of stent assisted treatment within DAPT related complications rate.

## Skull Base

Oral presentation

Microsurgical anatomy of the fiber tracts of the brainstem step by step during dissection

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### Objectives:

- Description of some technical nuances in steps for an adequate brainstem fiber dissection
- Describe the main microsurgical anatomy of the fiber tracts of the brainstem

**Background:** Fiber tracts of the brainstem have been described in the literature. Notwithstanding, it is still complex for an adequate understanding of the anatomy. Furthermore, can be frustrating and complex if the neurosurgeon doesn't know how to do it. Here, we simplify the steps during the dissection procedure.

**Methods:** We use 10 human anatomical specimens obtained during the courses in the Al-mefty micro neurosurgery laboratory at Arkansas Neuroscience Institute obtained to perform the steps for a white matter fiber dissection of the brainstem. After getting the cadavers, each one was under 10% formalin solution for at least 1 month. The pia mater and arachnoid were removed, keeping the perforator vessels. After the remotion, each brainstem was washed out and refrigerated at least for 2 weeks with a temperature of -15 C. To proceed with dissection, each brainstem was immersed in water until it thawed. For each dissection under the microscope, it was necessary (Instruments) a wood spatula, forceps, and micro-knife. In each step, we describe complementary microsurgical anatomy.

**Results:** Steps are recommended for the dissection procedure. During the procedure, we described 5 descending, 4 ascending, 3 transverse, and 4 tracts between the brainstem-thalamus. Videos and photos are added with some technical recommendations for a better appreciation.

**Conclusions:** We think that in this manner, it will be easier to understand the white fiber tracts of the Brainstem. In addition, this technique will appreciate the microsurgical quality of the specimens during the dissection. For these steps it will help the neurosurgeon to understand the 3D vision anatomy of the fibers of the brainstem, Furthermore, they can based on the different locations of the brainstem lesions, design individualized surgical approaches.

## Trauma

Oral presentation

### Use of intraparenchymal pressure monitors versus external ventricular drains in intracranial hemorrhage: a propensity-score matched analysis

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#### **Objectives:**

To assess the rate of mortality and in-hospital complications following placement of an EVD alone compared to an IPM following a traumatic intracranial hemorrhage (ICH).

**Background:** Increased intracranial pressure (ICP) following traumatic ICH can cause life-threatening brain herniation. Patients with suspected ICP are often treated with an external ventricular drain (EVD) preoperatively to monitor ICP and drain fluid from the ventricular space. Intraparenchymal pressure monitors (IPM) are alternative devices that are less invasive but do not permit fluid drainage.

**Methods:** The National Trauma Data Bank was queried from 2017-2019 for all patients with an ICH treated with either an EVD alone or IPM with or without a subsequent EVD. A random sample of 4,000 patients was selected from the IPM group to ensure a 4:1 control-to-treatment ratio for matching. Matching was performed between groups based on demographics, comorbidities, injury severity, and insurance type. Differences between the two groups in treatments and outcomes were compared using paired Student's t-tests and Pearson's chi-squared tests.

**Results:** A total of 27,807 patients matching the inclusion criteria were identified. Following sampling and propensity score matching, 4,000 patients in each group were identified. Patients in the IPM group had slightly longer lengths of stay in the intensive care unit (14.03 days vs. 13.48 days,  $p=0.04$ ) and hospital (22.23 days vs. 20.77 days,  $p<0.01$ ), higher rates of catheter-associated urinary tract infections (2.65% vs. 1.7%,  $p<0.01$ ) and pressure ulcers (5.83% vs. 3.98%,  $p<0.001$ ), and lower rate of home discharge (9.07% vs. 11.33%,  $p<0.001$ ). Patients in both groups were otherwise comparable.

**Table 1.** Outcomes, hospital complications, and discharge disposition following traumatic intracranial hemorrhage in patients who received an IPM vs. patients who received an EVD alone. Patients were propensity-score matched based on demographics, comorbidities, injury severity, and insurance type.

Variable	Paired T-Test or Chi-Squared Test		
	IPM (n=4,000)	EVD (n=4,000)	P-Value
Death	1,272 (31.80%)	1,213 (30.33%)	0.15
Hospital Length of Stay (days)	22.23 ± 23.53	20.77 ± 22.20	<0.01*
ICU Length of Stay (days)	14.03 ± 11.77	13.48 ± 11.94	0.04*
<i>Hospital Complications</i>			
Acute Kidney Injury	102 (2.55%)	84 (2.10%)	0.18
Alcohol Withdrawal	41 (1.03%)	40 (1.00%)	0.91
ARDS	140 (3.50%)	120 (3.00%)	0.21
Cardiac Arrest	143 (3.57%)	137 (3.43%)	0.72
CAUTI	106 (2.65%)	68 (1.70%)	<0.01*
Deep Vein Thrombosis	242 (6.05%)	201 (5.03%)	0.05*
Myocardial Infarction	14 (0.35%)	10 (0.25%)	0.41
Pressure Ulcer	233 (5.83%)	159 (3.98%)	<0.001*
Pulmonary Embolism	72 (1.80%)	63 (1.57%)	0.43
Sepsis	72 (1.80%)	51 (1.27%)	0.06
Stroke/CVA	101 (2.53%)	96 (2.40%)	0.72
Unplanned ICU Admission	148 (3.70%)	166 (4.15%)	0.30
Unplanned Intubation	165 (4.12%)	158 (3.95%)	0.69
Unplanned Reoperation	165 (4.12%)	154 (3.85%)	0.53
Ventilator-Associated Pneumonia	406 (10.15%)	338 (8.45%)	<0.01*
<i>Discharge Disposition</i>			
Home	363 (9.07%)	453 (11.33%)	<0.001*
Home Healthcare	91 (2.27%)	115 (2.88%)	0.09
Long-Term Care	1,242 (31.05%)	1,242 (31.05%)	1.00
Rehabilitation	840 (21.00%)	785 (19.62%)	0.13
Hospice	95 (2.38%)	101 (2.53%)	0.66
Left Against Medical Advice	14 (0.35%)	15 (0.38%)	0.85
Other Disposition	68 (1.70%)	62 (1.55%)	0.60

ARDS = acute respiratory distress syndrome, CAUTI = catheter-associated urinary tract infection, CVA = cerebrovascular accident, EVD = external ventricular drain, ICU = intensive care unit, IPM = intraparenchymal pressure monitor

\* = significant

**Conclusions:** Patients who received an IPM had slightly longer and more complicated hospital courses compared to patients who received an EVD alone but had otherwise comparable outcomes. IPMs can be used as a safe alternative to EVDs when clinically indicated.

## Oncology

ePoster presentation

Gamma knife radiosurgery using co-registration with PET-CT and MRI for recurrent nasopharyngeal carcinoma with previous radiotherapy

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**Objectives:** We retrospectively evaluated the efficacy of Gamma Knife radiosurgery (GKS) for recurrent nasopharyngeal carcinoma (NPC) in patients who previously underwent radiotherapy, and analyzed the treatment outcomes over 14 years.

**Background:** To improve local control in patients with recurrent NPC using GKS, we employed co-registration with positron emission tomography-computed tomography (PET-CT) and magnetic resonance imaging (MRI).

**Methods:** Ten patients with recurrent NPC who had previously received radiotherapy underwent stereotactic radiosurgery using a Gamma Knife® between 2005 and 2018. The median target volume was 8.2 cm<sup>3</sup> (range: 1.7–17.8 cm<sup>3</sup>), and the median radiation dose to the target was 18 Gy (range: 12–30 Gy).

**Results:** The NPCs recurred at the primary cancer site in 7 patients (70%), as distant brain metastasis in 2 (20%), and as an extension into brain in 1 (10%). The recurrent tumors in 7 of the 10 patients (70%) were found on the routine follow-up imaging studies. No adverse radiation effects were noted after GKS. The 1- and 3-year overall survival rates after GKS were 90% and 77%, respectively. The local failure-free survival rates at 6 months, 1 year, and 3 years after GKS were 80%, 48%, and 32%, respectively. The median interval from GKS to local failure was 8 months (range: 6–12 months). Univariate analysis revealed that using co-registration with PET-CT and MRI was associated with a lower local failure rate of recurrent NPC ( $p = 0.027$ ).

**Conclusions:** GKS is an acceptable salvage treatment option for patients with recurrent NPC who previously received radiation therapy. PET-CT and MRI co-registration for dose planning can help achieve local control of recurrent NPC.

## Spine

Oral presentation

### Minimally invasive versus open posterior-approach fixation in lumbar fracture injuries: a propensity-score matched analysis

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**Objectives:** To evaluate the outcomes following minimally-invasive percutaneous posterior fixation versus open posterior fixation following traumatic lumbar vertebral fracture injuries.

**Background:** Open posterior-approach fixation with hardware is a mainstay of surgical intervention for lumbar vertebral fractures. Recently, MIS techniques have also become increasingly common. MIS surgery has been shown to have quicker recovery but higher long-term revision rates for outpatient fusion; the benefit of MIS for traumatic fixation is less clear.

**Methods:** The National Trauma Data Bank was queried from 2017-2019 for all patients with a lumbar vertebral fracture injury treated with either MIS or open fixation. Propensity-score matching was performed between patients in each group based on demographics, comorbidities, injury severity, and insurance type. Differences between the two groups in treatments and outcomes were compared using paired Student's t-tests and Pearson's chi-squared tests.

**Results:**

A total of 904 patients matching the inclusion criteria identified. Following propensity score matching, 307 patients in each group were identified. Patients in the MIS group had comparable lengths of intensive care unit stay (3.74 days vs. 3.65 days, p=0.86) and hospital length of stay (12.84 days vs. 12.03 days, p=0.482) compared to the open group. The MIS group had a higher rate of pulmonary embolism (1.95% vs. 0.00%, p=0.014). There were no other differences in hospital outcomes or discharge disposition.



**Table 1.** Outcomes, hospital complications, and discharge disposition in patients undergoing minimally-invasive vs. open fixation following lumbar fracture injuries. Patients were propensity-score matched based on demographics, comorbidities, injury severity, and insurance type.

Variable	Paired T-Test or Chi-Squared Test		
	MIS (n=307)	Open (n=307)	P-Value
Hospital Length of Stay (days)	12.84 ± 16.36	12.03 ± 10.16	0.482
ICU Length of Stay (days)	3.74 ± 6.06	3.65 ± 5.87	0.860
<i>Hospital Complications</i>			
Acute Kidney Injury	5 (1.63%)	1 (0.33%)	0.101
Alcohol Withdrawal	3 (0.98%)	5 (1.63%)	0.477
ARDS	4 (1.30%)	1 (0.33%)	0.178
Cardiac Arrest	5 (1.63%)	1 (0.33%)	0.101
CAUTI	3 (0.98%)	1 (0.33%)	0.316
Deep Vein Thrombosis	7 (2.28%)	8 (2.61%)	0.794
Myocardial Infarction	1 (0.33%)	1 (0.33%)	1.00
Other Complication	12 (3.91%)	11 (3.58%)	0.832
Pressure Ulcer	3 (0.98%)	4 (1.30%)	0.704
Pulmonary Embolism	6 (1.95%)	0 (0.00%)	0.014*
Sepsis	1 (0.33%)	0 (0.00%)	0.317
Stroke/Cerebrovascular Accident	1 (0.33%)	1 (0.33%)	>0.999
Unplanned ICU Admission	13 (4.23%)	13 (4.23%)	>0.999
Unplanned Intubation	12 (3.91%)	6 (1.95%)	0.151
Unplanned Reoperation	12 (3.91%)	5 (1.63%)	0.085
Ventilator-Associated Pneumonia	6 (1.95%)	2 (0.65%)	0.155
<i>Discharge Disposition</i>			
Home	133 (43.32%)	127 (41.37%)	0.624
Home Healthcare	24 (7.82%)	35 (11.40%)	0.132
Skilled Nursing/Intermediate Care	82 (26.71%)	83 (27.04%)	0.927
Rehabilitation	57 (18.57%)	57 (18.57%)	1.00
Hospice	1 (0.33%)	0 (0.00%)	0.317
Left Against Medical Advice	1 (0.33%)	1 (0.33%)	1.00
Other Disposition	5 (1.63%)	3 (0.98%)	0.477

ARDS = acute respiratory distress syndrome, CAUTI = catheter-associated urinary tract infection, CVA = cerebrovascular injury, ICU = intensive care unit, MIS = minimally-invasive

\* = significant

**Conclusions:** Given the lack of substantial short-term benefits in length of stay, hospital complications, and discharge disposition, open fixation should be preferred over MIS fixation in traumatic lumbar fractures.



## Neurovascular Surgery

Oral presentation

Anatomical defining routes and approaches to anterior communicating artery aneurysms: role of dome projection, number of lobes and blood flux: 315 cases

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**Objectives:** Anterior communicating artery (ACoA) aneurysms are common intracranial aneurysms. Despite advances in endovascular therapy, microsurgical clipping remains an important treatment for aneurysms with broad necks, large size, intraluminal thrombus, complex branches, or previous coiling.

**Background:** Anatomical considerations identify safe corridors for aneurysm access. The authors examine relationships between dome projection, corridors of access and approaches, and surgical outcomes.

**Methods:** Preoperative catheter and CT angiograms were evaluated to characterize aneurysm dome projection. Aneurysm projection was categorized into dome projections, blood flux and number of lobes. Those factors were correlated to aneurysm dome projection and patient outcomes.

**Results:** A total of 315 patients with micro surgically treated ACoA aneurysms were identified over a 9 years period. Surgical clipping was performed on 268 ruptured and 47 unruptured aneurysms. Good outcomes were observed in 90% of patients with unruptured aneurysms and 80% of those with ruptured aneurysms, with a mortality rate < 1% among patients with unruptured aneurysms. Increasing age ( $p < 0.01$ ), larger aneurysm size ( $p = 0.03$ ), and worse preoperative modified Rankin Scale score ( $p < 0.01$ ) affected outcomes adversely. Aneurysms projecting superiorly and posteriorly multivariate analysis demonstrated worse clinical outcomes in these patients ( $p < 0.01$ ).

**Conclusions:** Anteriorly and inferiorly projecting aneurysms, are simpler to treat micro surgically, and have more favorable outcomes. Superior and posterior dome projections make ACoA aneurysms more difficult to visualize and more difficulties, specially for perforator preservation. Dome projection can be determined preoperatively from images and can help anticipate dissection routes and outcome of the patients.

## Spine

Oral presentation

### Survival following fusion compared to nonoperative bracing following traumatic occipitocervical dissociation: a propensity-score matched analysis

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**Objectives:** To assess outcomes following nonoperative bracing compared to surgical fusion in traumatic occipitocervical (OC) dissociation.

**Background:** Surgical fusion is generally preferred over nonoperative bracing for traumatic OC dissociation, as it provides greater long-term stability and improvements in pain. Bracing is occasionally performed instead in populations with contraindications to surgery such as the elderly or patients with anticoagulant use, however, the implications of such decisions are unclear.

**Methods:** The National Trauma Data Bank was queried from 2017-2019 for all patients with traumatic OC dislocation or subluxation treated with either non-surgical bracing or surgical fusion. Propensity-score matching was performed between patients in each group based on demographics, comorbidities, injury severity, and insurance type. Differences between the two groups in treatments and outcomes were compared using paired Student's t-tests and Pearson's chi-squared tests.

**Results:** A total of 474 patients matching the inclusion criteria were identified. Following propensity score matching, 173 patients in each group were identified. Patients in the bracing group still had a significantly higher proportion of elderly patients compared to the fusion group (28.32% vs. 13.87%,  $p < 0.001$ ) despite being matched on age. Patients in the bracing group had a significantly higher rate of death (20.81% vs. 2.89%,  $p < 0.001$ ), longer ICU stay (6.06 days vs. 12.79 days,  $p < 0.001$ ) and hospital stay (10.31 days vs. 20.76 days,  $p < 0.001$ ), higher rates of DVT (1.73% vs. 8.67%,  $p < 0.01$ ) and ventilator-associated pneumonia (2.89% vs. 9.83%,  $p < 0.01$ ), and lower rates of discharge to a rehabilitation facility (10.40% vs. 32.95%,  $p < 0.001$ ).

**Table 1.** Outcomes, hospital complications, and discharge disposition in patients undergoing nonoperative bracing versus surgical fusion following traumatic occipitocervical dissociation. Patients were propensity-score matched based on demographics, comorbidities, injury severity, and insurance type.

Variable	Paired T-Test or Chi-Squared Test		
	Bracing (n=173)	Fusion (n=173)	P-Value
Death	36 (20.81%)	5 (2.89%)	<0.001*
Hospital Length of Stay (days)	10.31 ± 12.35	20.76 ± 14.45	<0.001*
ICU Length of Stay (days)	6.06 ± 9.49	12.79 ± 10.95	<0.001*
<i>Hospital Complications</i>			
Acute Kidney Injury	3 (1.73%)	3 (1.73%)	1.00
Alcohol Withdrawal	0 (0.00%)	1 (0.58%)	0.32
ARDS	1 (0.58%)	3 (1.73%)	0.31
Cardiac Arrest	11 (6.36%)	5 (2.89%)	0.12
CAUTI	2 (1.16%)	3 (1.73%)	0.65
Deep Vein Thrombosis	3 (1.73%)	15 (8.67%)	<0.01*
Myocardial Infarction	0 (0.00%)	0 (0.00%)	0.99
Other Complication	5 (2.89%)	6 (3.47%)	0.76
Pressure Ulcer	7 (4.05%)	11 (6.36%)	0.33
Pulmonary Embolism	2 (1.16%)	4 (2.31%)	0.41
Sepsis	2 (1.16%)	1 (0.58%)	0.56
Stroke/Cerebrovascular Accident	1 (0.58%)	4 (2.31%)	0.18
Unplanned ICU Admission	4 (2.31%)	7 (4.05%)	0.36
Unplanned Intubation	10 (5.78%)	11 (6.36%)	0.82
Unplanned Reoperation	2 (1.16%)	3 (1.73%)	0.65
Ventilator-Associated Pneumonia	5 (2.89%)	17 (9.83%)	<0.01*
<i>Discharge Disposition</i>			
Home	46 (26.59%)	35 (20.23%)	0.16
Home Healthcare	8 (4.62%)	11 (6.36%)	0.48
Skilled Nursing/Intermediate Care	47 (27.17%)	60 (34.68%)	0.13
Rehabilitation	18 (10.40%)	57 (32.95%)	<0.001*
Hospice	3 (1.73%)	0 (0.00%)	0.08
Left Against Medical Advice	0 (0.00%)	0 (0.00%)	0.99
Other Disposition	1 (0.58%)	5 (2.89%)	0.10

ARDS = acute respiratory distress syndrome, CAUTI = catheter-associated urinary tract infection, CVA = cerebrovascular accident, ICU = intensive care unit

\* = significant

**Conclusions:** Increased age likely played a considerable factor in the decision to nonoperatively brace rather than surgically fuse. The bracing group was over seven times as likely to die compared to the fusion group. Withholding of surgery in elderly patients should be reconsidered to reduce the risk of mortality.

## Spine

ePoster presentation

### A review of postoperative C5 palsy - is it predictable by intraoperative monitoring?

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**Objectives:** The object of this study is to determine if postoperative C5 palsy can be predicted by intraoperative neurophysiological monitoring.

**Background:** Postoperative C5 palsy is a well-known complication of cervical spinal surgery, with a reported frequency of 0-30%. The causes include intraoperative injury, impaired perfusion, and stretching of the C5 root. It is difficult to predict these complications preoperatively and intraoperatively.

**Methods:** A retrospective review of 243 cervical spondylosis cases operated between January 2011 and December 2021 at a single institution was performed. Comparisons were made between anterior and posterior surgeries. Anteriorly, anterior discectomy and fusion was performed, and posteriorly, laminoplasty/laminectomy was performed. Transcranial motor evoked potential (Tc-MEP) and somatosensory evoked potential (SSEP) were performed in all cases; Tc-MEPs were performed in four channels of the short abductor pollicis brevis and tibialis anterior muscles to detect long tract signs, and the alarm points for Tc-MEP and SSEP were a 50% potential drop and 2 ms latency prolongation, respectively.

**Results:** There were 96 anterior and 147 posterior cases, with C5 palsy accounting for 7 (2.9%) of all cases. The age of C5 paraplegia was 62-71 years (mean 67.7) anteriorly and 70-80 years (mean 74) posteriorly, and the gender was anterior; 2 males (66.7%) and posterior; 2 males (50%). Intraoperative Tc-MEP was decreased in 3/7 (43%) and transient latency prolongation of SSEP was observed in 2/7 (9%) of the patients with C5 palsy. Immediately postoperative C5 palsy occurred in 4 patients, and 1-3 days postoperative C5 palsy in 3 patients. Improvement of C5 palsy was MMT5; 1 case, MMT4; 3 cases, MMT3; 3 cases.

**Conclusions:** The incidence of postoperative C5 palsy was 2.9% and did not differ between anterior and posterior as previously reported. There are risk factors for the development of postoperative C5 palsy, such as spinal circulation failure and weakness before decompression.

## Neurovascular Surgery

ePoster presentation

Intraoperative motor and somatosensitive evoked potential as a new weapon in preventing neurological deficits in aneurysms clipping: 51 cases

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**Objectives:** The present study investigated the correlation between intraoperative motor evoked potential (MEP) and somatosensory evoked potential (SSEP) monitoring and motor outcomes in patients with aneurysm treated with surgical clipping.

**Background:** Furthermore, the use of this monitoring provides a relatively satisfactory neurophysiological predictor of postoperative motor deficits (PMDs) in patients with ruptured and unruptured aneurysms demonstrating intraoperative vasospasm and evolving ischemia.

**Methods:** A total of 51 patients with aneurysms were monitored during the operation of their single or multiple aneurysms. Patient demographics, clinical characteristics, intraoperative monitoring data, and follow-up data were retrospectively reviewed.

**Results:** The effectiveness of using changes in MEP/SSEP to predict vasospasm or motor deficit due to late ischemia was taken into account. Only one of the cases had immediate detection of deficit in evolution and four cases had ischemia in the postoperative period, one of these cases, diffuse malignant ischemia throughout the brain, which we associate more with malignant vasospasm resulting from abundant HSA (fisher 3) and not due to intraoperative vascular manipulation.

**Conclusions:** We found that both MEP and SSEP intraoperative monitoring are useful for predicting short- and long-term neuropsychomotor deficits in patients with cerebral aneurysm undergoing surgeries for ischemia and vasospasm. The ideal method of intraoperative neuromonitoring to predict deficits does not yet exist because there are multiple factors such as Fisher's classification, Hunt Hess at patient admission, presence of vasospasm prior to surgery, among others, but cranial motor and sensory monitoring have been showing big predictive value. Motor and somatosensory evoked potential monitoring is definitely a very good weapon in prevention of ischemia and vasospasm.

## Oncology

ePoster presentation

### Fahr disease presenting by multiple cerebral calcifications

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**Objectives:** We herein report a rare case of Fahr disease presenting with multiple cerebral calcifications.

**Background:** Fahr disease, also known as idiopathic basal ganglion calcification, is a rare and genetically heterogeneous neurological disorder.

**Methods:** A 63-year-old woman presented with dizziness to a local clinic. Brain computed tomography performed on admission revealed multiple high-intensity lesions in both basal ganglia, both cerebellar hemispheres, and the left frontal lobe. In contrast, brain magnetic resonance imaging (MRI) showed no prominent lesions on T2- and T1-weighted image, and there was no contrast enhancement after gadolinium injection. However, multiple dark signals were detected on gradient echo MRI. The location and radiological appearance of the lesion resembled those of a physiological intracranial calcification, except for asymmetric calcification in both cerebellar hemispheres and the left frontal subcortical white matter. The patient was diagnosed with basal ganglion calcification with multiple cerebral cavernous malformations or, less likely, brain tumors.

**Results:** Through a careful radiological and clinical review, the calcifications were diagnosed as Fahr disease. The patient was planned to undergo follow-up.

**Conclusions:** It is important to consider the presence of multiple intracranial calcifications in the basal ganglia, cerebellum, or deep subcortical white matter as a warning sign for Fahr disease.

## Oncology

ePoster presentation

Tentorial meningiomas: extensive casuistic of 91 cases discussion analysis, classification due to location and literature review

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**Objectives:** Meningiomas of the tentorium originate or implant facing the tentorium. They can adhere to veins, arteries and cranial nerves. Preferably unilateral and growing supra or infra tentorial.

**Background:** They can reach the sinus venosus and thus reach large volumes. They are confused with basal meningiomas of other locations. Difficult to define whether the injury is purely tentorial.

**Methods:** We present a series of 91 cases of tentorium meningiomas operated on at the Neurological Assistance Service of São Bernardo, comparing data found in the literature and demonstrating our surgical technique, implantation site and approaches.

**Results:** According to the literature, we found about 10% of meningiomas in the posterior fossa. Of the 756 meningiomas operated on in our study, 91 were from the tentorium, that is, 14%, corroborating the statistics. Our surgical technique used was based on dissection to expose the tumor and Debulking with traction of the tumor capsule. The suboccipital or occipital suboccipital approach was chosen. Simpson 1 was performed in 36 cases, decreasing for the other degrees. In the follow-up, we were able to follow all the cases up to 6 months after the operation. After that, we were able to keep in touch with 57 patients for up to 2.5 years. We had 12 cases of recurrence and 9 required reoperation. There were 2 deaths in total. Among the complications, hydrocephalus found in 17 cases, cerebellar ataxia in 15, hemiparesis in 7, deficit of VII and VIII in 7, liquorish fistula in 5, deficit of low pairs in 3 stand out.

**Conclusions:** Tentorial meningiomas represent the majority of posterior fossa meningiomas. Their knowledge and study are fundamental for a better approach and clinical surgical support to the patient, because despite being mostly benign, they can present high rates of mortality and morbidity.

## Oncology

ePoster presentation

### Brainstem cavernous malformations presentation of 20 cases and literature review and recommendations

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**Objectives:** Bleeding from brainstem cavernomas may cause severe deficits due to the absence of non-eloquent nervous tissue and the presence of several ascending and descending white matter tracts and nerve nuclei. Surgical removal of these lesions presents a challenge to most surgeons.

**Background:** We present our experience with the surgical and clinical treatment of 20 patients with brainstem cavernomas. Important aspects of microsurgical anatomy are reviewed. The surgical management, with special focus on new intraoperative technologies as well as controversies on indications and timing of surgery are presented.

**Methods:** were retrospectively reviewed to evaluate the outcome of 20 patients with brainstem cavernous malformations between 1999 and 2009. These lesions were classified according to their anatomical location. Criteria used were: previous hemorrhages (one, two or more episodes), the possibility of total surgical removal at first glance, presence of previous or new transient postoperative deficits and the patient's choice of clinical support as unique treatment. It was also considered the surgical techniques used and recommended by literature.

**Results:** We analyzed 20 cases treated in our service in the last 30 years. Eleven were submitted to surgical treatment. 9 patients did not accept the surgical option and kept clinical follow up.

The patients had an average age of 54 years, had cavernomas mostly at pons or at midbrain-pons or at the pons-medullary transition.

The most part had partial clinical improvement and cranial nerve functions recovery.

**Conclusions:** According to our experience, surgical resection remains the treatment of choice of brainstem cavernomas especially if there was previous hemorrhage and the lesion reaches the pial surface of brainstem. An excellent outcome with very low morbidity and no mortality may be achieved if the surgery is performed by experienced neurosurgeons in selected referral centers employing all the currently available technology.



## Spine

ePoster presentation

### Early improvement of pain that result from vertebral fractures with the use of kyphoplasty: 154 cases

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**Objectives:** Approximately 1.5 million fractures secondary to osteoporosis occur in the United States each year; 700,000 of these are spine fractures—more than hip and wrist fractures combined. Worldwide, 1 in 3 women and 1 in 8 men over the age of 50 are affected by osteoporosis.

**Background:** In the past, surgeons used standard open surgical procedures to fix compression fractures from osteoporosis. Open procedures require larger incisions to give the surgeon more room to operate. Kyphoplasty gives surgeons a way to fix the broken bone without the problems associated with open surgery.

**Methods:** We will show in this paper report the positive experience in 154 cases of osteoporotic vertebral fractures, treated with kyphoplasty in comparison to other surgical techniques like vertebroplasty. We selected only cases with vertebral osteoporotic fractures, with back pain using a simple verbal 0-10 numerical rating scale (verbal NRS).

**Results:** Kyphoplasty gives surgeons a way to fix the broken bone without the problems associated with open surgery. Unlike open surgery, which involves an incision and the use of larger instruments. The goal of kyphoplasty is to return the fractured vertebra as close as possible to its normal height. This is done by specific and special technique. This reduces pain (verbal NRS) and spine deformity (kyphosis), enabling patients to get back to normal activities.

**Conclusions:** Our results show kyphoplasty is a safe and effective method to relieve pain (verbal NRS) and correct the deformity associated with an osteoporotic VCF. All patients had a shorter recovery and pain relief in 90% of cases, some deficits of strength also got better. The technique is successful in relieving the pain of fractured vertebrae. When well indicated, the method shows better recovery time and pain relief to patients.

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## Spine

Oral presentation

Peri radicular infiltration as a minimal invasivetherapy of back pain in 2.280 cases

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**Objectives:** To assess the efficacy of corticosteroid and lidocaine injections in patients with sciatica and lumbar backpain due to lumbar disc herniation or lumbar spondylosis by a prospective study.

**Background:** There were analyzed 2280 patients with sciatica and lumbar backpain due to lumbar disc degeneration or spondylosis. These patients were divided into two groups chosen to peri radicular blocks with corticosteroids and lidocaine, those with radicular pain and facetary block with the same drugs those with backpain caused by spondylosis or facetary hypertrophy. The cases had a follow-up of 12 months.

**Methods:** The Outcomes were evaluated by visual analogue scale (VAS) and Oswestry disability index (ODI).

**Results:** Clinical analysis showed improvement in pain reduction in the first week on ODI and VAS in the group with radicularand facetary blocks. In comparison to the following months, however there were differences observed after three months of follow-up. The transforaminal root block presents a good method for treatment of acute sciatica and showed no improvement in a long-term-follow-up, and the facetary block have a better improvement between 3 to 6 monts. After that those with facetary disease with good response were made radiofrequency treatment with excellent results. Those with radiculopathy completionand poor facetary block results, were schedule for decompress and arthrodesis. More than 60% of patients were fine without operative therapy.

**Conclusions:** Transforaminal root block and facetary block are an excellent method with high evidence to treat sciatica in short-term follow-up, but for long-term (more than six months) follow-up is just moderate.

## Oncology

ePoster presentation

### Series of tumors from the pineal region: multiplesetiologies aproaches and genetics

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**Objectives:** Tumors of the pineal region are collectively rare. The distribution by type is approximately 35% for germ cell tumors, 28% for pineal parenchyma tumors, and 28% for gliomas and 8% for meningiomas. Adults tend to get tumors. Children are affected by the more aggressive varieties. The vast majority occur in the pineal region, but some in adjacent areas, such as the third ventricle and suprasellar region.

**Background:** During the analysis of the exams, we were able to come across the most varied tumor pathologies in this region, each with its peculiarities, with its challenges and difficulties.

We describe nine cases of tumors in the pineal region, with their clinical, imaging and pathological characteristics, the procedures performed and the clinical evolution of these patients.

**Methods:** This is a descriptive study, with a qualitative approach, of the experience report type lived by a general neurosurgery team that in the last seven years identified, diagnosed, treated and followed the evolution of NINE patients with tumors in the pineal region. After such therapies, the patients continued in outpatient neurological follow-up to analyze sequelae, relapses and individual recovery.

**Results:** Nine patients were studied, treated, operated on and followed up, with different ages and different symptoms.

The results were 1 cure, 2 follow-ups without recurrence, 2 follow-ups with relapse\residual, 1 withdrew from follow-up and 1 was unable to undergo adjuvant treatment and had metastasis to the neuroaxis.

**Conclusions:** Tumors in the pineal region are complex tumors, difficult to access, highly stigmatized by the presence or absence of markers such as gonadotropins and alpha-fetoproteins, which end up making the severity of the condition insignificant. much contribution to medical and surgical training.

## Trauma

ePoster presentation

Case report of conservative treatment in a complex cervical fracture due to lack of local technology with good evolution

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**Objectives:** Traumatic spondylolisthesis of the axis, known as “hanged man fracture”, is the second most frequent type of C2 fracture. In general, this is a fatal injury, but this patient survives the trauma.

**Background:** We describe a case report with a fantastic evolution beyond the treatment realized.

**Methods:** A 50-year-old male patient was admitted to the emergency room of a public hospital after suffering a high-speed motorcycle accident, with rachimedular trauma. The neurological physical examination showed absence of motor and sensory deficits, preserved deep reflexes in all limbs, and unaltered sphincter function. Complementary exams showed the following alterations: grade I anterolisthesis of C2 over C3 with compression fracture of the vertebral body of C3, diastasis between the anterior arch of C1 and the odontoid process, fracture of the arch anterior and left lateral mass of C1 and retrolisthesis of C3-C4, C4-C5 and C5-C6.

**Results:** He remained under intensive care with the possibility of an invasive approach by the general surgery team, but due to unfavorable clinical conditions he ended up not being indicated. Subsequently, the condition improved and satisfactory results were achieved with only conservative treatment, and the patient was discharged without pain, deficit, limitation or any type of sequel.

**Conclusions:** He is currently being followed up on an outpatient basis for 3 months with a question about the indication for surgical treatment for a cervical deformity in a neurologically stable patient. Traumatic spondylolisthesis of the axis, known as “hanged man fracture”, is the second most frequent type of C2 fracture. In general, this is a fatal injury, but when the patient survives the trauma, there are no neurological injuries and a third of them present another fracture. Despite being considered a stable lesion, surgical treatment is indicated in order to reduce the rates of pseudarthrosis that occur in cases treated conservatively.

## Trauma

ePoster presentation

### Atypical case of post-traumatic fibrosis in the spinal canal simulating tumor behavior

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**Objectives:** The most common causes of acute paraplegia that we encounter in our neurosurgical day-to-day are due to SCI with hematomas, medullary edema or vertebral fractures, vascular injury, tumors, clinical diseases such as GB or demyelination such as MS outbreaks.

**Background:** When a patient enters a specialized service with an atypical and aggressive acute neurological condition, it is necessary for the team to be prepared for diagnoses and proactive, targeted and efficient conducts.

**Methods:** A 54-year-old female patient without previous illnesses was admitted to a hospital emergency room with an acute condition of paraplegia. Symptoms of sudden onset 10 hours ago with pain that slowly progressed. He denied trauma, physical exertion, or acute abrupt movement. MRI showed an intracanal expansive lesion in the dorsal column capturing extramedullary intradural contrast with an aspect suggestive of dorsal meningioma. She was promptly submitted to surgery with resection and material sent for analysis. Surgery performed with intraoperative electrophysiology that showed a subtotal deficit pre op and immediate improvement in all potentials at the end. After a thorough microscopic result, they saw that it was a cicatricial fibrotic lesion.

**Results:** The acute neurological deficit has its prognosis, both in terms of recovery and minimization of permanent sequelae closely associated with time. Therefore, the faster and more directed the attitude of the assistant team, the better the patient's chances.

**Conclusions:** Late fiber cicatricial lesion with spinal cord compression and severe neurological symptoms are extremely rare and atypical and are generally exclusion diagnoses and not priority diagnostic hypotheses. But it is essential that it be treated with the same precision and aggressiveness as we treat medullary tumors, since they behave in a similar way.

The importance of sharing atypical and rare experiences like to consider the possibility of similar diagnoses.

## Oncology

ePoster presentation

### Melanocytic nerve sheath tumor: a new classification of a malignant cervical expansive lesion: case report

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**Objectives:** Malignant melanotic nerve sheath tumor (MMNST) is a peripheral nerve sheath tumor uniformly composed of tumor cells with Schwann cell features and melanocytic differentiation, usually arising in association with spinal or autonomic nerves.

**Background:** MMNST usually arises from spinal or autonomic nerves near the midline. However, cases have been reported in the gastrointestinal tract, as well as in bones, soft tissues, heart, bronchi, liver and skin. Our case presents one in the cervical medulla.

**Methods:** FSS, 42nd year old, female, without previous illness, evolved for about three weeks with walking and balance difficulties and progressed to grade 2 force AP: melanocytic schwannoma. After surgery, the patient had complete motor recovery with only mild paresthesia in the right C5 territory (partial sensory deficit). Epidemiology: MMNST is rare and occurs mainly in adults. After doing all the examinees the patient was submitted to an aggressive surgery.

**Results:** In some series, >50% of patients with MMNSTs have evidence of a Carney Complex, autosomal dominant, sometimes familial, multiple neoplastic syndromes. However, other series have observed an association with Carney Complex in ≤ 5% of affected patients. Other cases are considered sporadic and of unknown etiology.

**Prognosis and prediction:** The behavior of MMNST is difficult to predict and metastases may occur in the absence of characteristic morphologically malignant lesions.

**Conclusions:** Here we have the report of a rare, atypical case of a recently reclassified tumor, previously known as melanocytic schwannoma, but now with all the above characteristics it is classified as a malignant and very aggressive tumor.

Knowing and recognizing cases like this one, we can prioritize, before clinical rehabilitation, adjuvant therapy with joint oncological therapy of these patients to improve the prognosis in the medium and long term.

## Global Neurosurgery

ePoster presentation

### A rare expansive intramedullar lesion: intramedullar neurotoxoplasmosis

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**Objectives:** Central nervous system (CNS) toxoplasmosis ranks third as the most prevalent AIDS-defining opportunistic infection in Brazil, with the brain being the most common site of involvement. Myelitis caused by *Toxoplasma gondii* is considered rare even in cases of immunosuppression, but its hypothesis must be considered and is largely associated with severity and unfavorable outcome.

**Background:** Our case differs from myelitis, but from an acute spinal cord compression caused by a toxoplasmosis lesion that mimicked tumor behavior and which was largely reversed with decompression and resection of the lesion.

**Methods:** Patient was admitted to the emergency room of the public hospital with acute tetraparesis with pyramidal release and loss of asymmetrical strength worse on the right. On the day of the surgery, he had a febrile focus without leukocytosis, so serologies were collected which resulted in HIV positive.

**Results:** After the surgery, the patient had a good recovery of the deficits, Anatomy suggested only an inflammatory process and questions the possibility of toxoplasmosis.

**Conclusions:** Although it is very common in HIV patients to detect infectious lesions such as toxoplasmosis, cryptococcosis and even tuberculosis, in the case of intramedullary lesions, especially in the cervical spine, it is rare for us to investigate and consider such a possibility, even more so when the condition of carrier of the AIDS virus is not known. and such cases are extremely rare.

Thus, we learned from this case that young patients with acute neurological deficits and MRI demonstrating contrast-enhancing intraspinal lesions and with perilesional vasogenic edema should be routinely screened for infectious and opportunistic diseases, The conduct in the face of an expansive lesion causing an acute neurological deficit must be the same regardless of the tumor or infectious etiology, the pathology being extremely fundamental in the identification and differentiation of these cases.

## Oncology

ePoster presentation

**Chordoma: a neurosystem tumor that is considered benign lesion, but can actually have a malignant behavior**

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**Objectives:** A chordoma is a rare type of cancerous tumor that can occur anywhere along the spine, from the base of the skull to the tailbone. Chordomas grow slowly, gradually extending into the bone and soft tissue around them. They often recur after treatment, and in about 40 percent of cases the cancer spreads ([metastasizes](#)) to other areas of the body, such as the lungs.

**Background:** A chordoma anywhere along the spine may cause pain, weakness, or numbness in the back, arms, or legs. A chordoma at the base of the skull (occipital chordoma) may lead to double vision (diplopia) and headaches. A chordoma that occurs in the tailbone (coccygeal chordoma) may result in a lump large enough to be felt through the skin and may cause problems with bladder or bowel function.

**Methods:** We will show in this paper report the recent experience in five cases of chordomas that occurs in both extreme of neuroaxis that was submitted to a very good surgery resection and evaluated with recurrence, local metastasis and even metastasis of different systems as respiratory and skeletal muscle.

**Results:** Chordomas are slow growing, yet aggressive and life-threatening tumors. Outcomes for chordoma patients vary widely and are highly dependent on the course of treatment received and the individual tumor's behavior. Modern treatment approaches can significantly prolong patient survival, and, with appropriate care, many patients can be cured.

**Conclusions:** Because the course of treatment received is so important for a patient's outcome, we aim to provide the information patients need to make educated treatment decisions and obtain the best care possible. This paper current treatment options available to chordoma patients and lays out points to consider when making treatment decisions.



## Neurovascular Surgery

Oral presentation

Posterior circulation arterial bypass and revascularization: early experiences

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**Objectives:** Sharing of early experiences of posterior circulation revascularization.

**Background:** The accomplishment of such a bypass demands highly technical and operative skills. Posterior circulation arterial bypasses are indicated in a number of neurovascular conditions including Posterior circulation giant aneurysm, vertebrobasilar ischemic insufficiency, Moya moya disease, arterial dissection, and traumatic/ iatrogenic arterial injury.

**Methods:** Cases were reviewed retrospectively.

**Results:** Total 276 EI-IC and IC-IC bypass in 220 patients from 2010 to 2022. 15 of them are posterior circulation bypass and revascularizations. 1st case of posterior circulation bypass was done after having 140 anterior circulation bypasses. Our indications were post circulation complex/giant/fusiform aneurysm-09 cases, VBI-01case, and iatrogenic VA injury-05 cases. 01 patient developed hemiplegia and 02 patients died postoperatively.

**Conclusions:** Indications, usefulness, and results of post-circulation bypasses are not well established due to less frequency of bypass throughout the world. We have just started the journey of posterior circulation bypass; Time is not mature for a conclusion but early results are impressive.

## Neurovascular Surgery

Oral presentation

Cerebral revascularization by EC-IC bypass in ischemic conditions of different etiologies other than MMD

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**Objectives:** To share Cerebral revascularization by EC-IC bypass in ischemic conditions of different etiologies other than MMD.

**Background:** After the failure of the EC-IC bypass trial, neurosurgeons were in search of cases where EC- IC bypass would help the patients in preventing future strokes and neurological improvement.

**Methods:** Patients in these cases series with TIA/stroke/recurrent stroke were evaluated clinically for the history of TIA or stroke with subsequent significant recovery. Then the cases were evaluated radiologically for cerebral ischemia. MRI of the brain was done in the ischemic protocol to see cerebral ischemic zone/s and arterial stenosis. To see the arterial pathology dynamic CTA was done in all cases with MRA. DSA was done in 03 cases. When clinical features, cerebral ischemia on MRI and arterial stenosis/occlusion on angiogram were concordant, only then EC-IC bypass was done. After the bypass, all patients were followed up regularly clinically and radiologically. All recorded data were reviewed retrospectively. All bypass was done from January 2015 to March 2023.

**Results:** The total no. of cases was 48. 29 were male and 19 were female. The age range was 25-72 years. Follow up period was 72-12 months. Etiologies were atherosclerosis, Infection, and thrombosis. High flow EC-IC bypass was done in one case. STA- MCA bypass was done in the rest of the cases. All were ambulant with static neuro-status without new stroke till the last follow-up. All bypasses were patent till the last follow-up. No new permanent neuro-deficit occurred. Re-vascularized patients were at least ambulant till the last follow up except 02 patients who died postoperatively. Documented recurrent TIA and stroke with patent bypass were seen in 03 cases.

**Conclusions:** In this small series, cases with clinical features, cerebral ischemia and arterial stenosis/occlusion on angiogram were concordant and we found such concordances resulted in a positive outcome with cerebral revascularization.

## Spine

Oral presentation

### Proposal of a new score system (Cervical Surgical Score) for management of degenerative cervical myelopathy

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**Objectives:** Our purpose is to present the Cervical Surgical Score (CSS) which could help in identifying complex Degenerative Cervical Myelopathy (DCM) cases, suggesting a surgical strategy.

**Background:** To date, no shared algorithms with the aim of guiding surgical strategy in complex cases of DCM exist.

**Methods:** We created the CSS based on multidisciplinary and literature-focused discussions, based on eight parameters including number of levels of cervical pathology and myelopathy, type and predominance of compression and grade of clinical myelopathy. We prospectively enrolled surgical DCM patients in a 15-months period, collecting clinical and radiological data. During outpatient clinic a specific surgical indication was offered to DCM patients. To validate the score, each outpatient clinic surgical indication was compared *a posteriori* to the one that resulted from multidisciplinary CSS scoring, focusing on patients for which both an anterior and posterior approach were considered suitable.

**Results:** A total of 100 patients were enrolled (median follow-up of 237.1 days). In 53% of patients the pathology was present at more than two levels. According to CSS calculation, 14% of patients resulted in the "grey zone", where both an anterior and posterior approach were deemed feasible. Among them, in 42.8% of cases the CSS allowed a modification of the originally planned surgery. Looking at outcome, an improvement of m-JOA score in 62% of patients was disclosed.

**Conclusions:** This preliminary study showed the reliability and usefulness of CSS in detecting complex DCM cases, requiring further analysis by expert spine surgeons, suggesting a surgical strategy.

## Epilepsy

Oral presentation

### Epilepsy and low-grade glioma: seizure control after surgical resection - a retrospective cohort study

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**Objectives:** We aimed to determine factors associated with seizure control in patients after low grade glioma (LGG) resection.

**Background:** Seizures are a common manifestation in patients with low grade glioma (60-75%), and 60 – 90% patients attain seizure freedom after resection. Seizure control varies with histopathology, extent of resection and type of seizures. There is inconsistency in literature regarding utility of anti-epileptic drugs (AED) after tumor resection.

**Methods:** It was a retrospective cohort study. Medical record of all patients who underwent LGG resection at our center from 2019 to 2021 were reviewed; 77 patients fulfilled the selection criteria. Patients were also contacted via phone calls to collect information about their seizure control as per Engel Classification. Data was analyzed using SPSSv21.

**Results:** The mean age was  $34.9 \pm 11.3$  years, and there was male predominance (62; 80.5%). Generalized seizures were the most common type (54; 70%), and Levetiracetam was the most commonly prescribed AED (60; 77.9%). The median duration of pre-operative AED use was 4 (IQR: 1 – 24) months. Frontal lobe was the most common location of tumor (36; 46.8%). Most of the patients had their surgery under general anesthesia (51; 61.4%), while 29 (37.7%) underwent awake craniotomy. Nearly half of the patients had a gross total resection (31; 40.3%), and another 15 (19.5%) had near-total resection. Sixteen patients (20.8%) had their AEDs stopped within first 6 months post-operatively (at variable intervals), and all of them had Engel Class IA to ID control at time of follow-up ( $p = 0.008$ ). The 12 patients with Grade I glioma also had optimum seizure control ( $p = 0.032$ ).

**Conclusions:** Patients with grade I glioma have better seizure control after surgery. Tumor biopsy is associated with worse seizure outcome, though not statistically significant. Larger studies are needed to determine the ideal time and patient group for discontinuing AED after surgery.

## Functional

ePoster presentation

### Geniculate neuralgia: microsurgical management

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**Objectives:** We present a case of GN with bilateral pain treated by sectioning of the NI and MVD on the primary side of GN.

**Background:** Geniculate neuralgia (GN) is a rarely seen condition characterized by intermittent, severe, stabbing deep ear pain. The GN is seemed to be due to, partly from microvascular compression of the nervous intermedius (NI).

**Methods:** Case report with operative video.

**Results:** A 21-year-old male presented with a history of severe, intermittent, stabbing deep earache, primarily on the right ear but last six months it became bilateral. His pain was exacerbated by the touch of the outer ear and wind on the outer ear. Clinical examination revealed no abnormality.

After exploring the right cerebellopontine angle, searching of the vestibulocochlear nerve complex revealed anatomical compression by a superior vascular loop of the anterior inferior cerebellar artery (AICA). Both fascicles of the NI were found and eventually sectioned. An autologous fascia-muscular graft was placed to separate the superior arterial loops from the vestibulocochlear complex. A suspicious vascular loop of PICA was also found at REZ of IX and X cranial nerves which was also kept away by an interposing muscular graft. Then IX nerve was identified and transected at the cistern. The patient became pain-free immediately after the operation (bilaterally) and was discharged on 3<sup>rd</sup> postoperative day.

**Conclusions:** In GN unilateral pathology can cause bilateral pain which can be cured by surgical treatment on the primary side.

## Functional

ePoster presentation

Micro vascular decompression (MVD) by slinging of tortuous vertebrobasilar artery (TVBA) to petrous dura: technical videos presentation

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**Objectives:** Here, we present (videos) a slinging technique of VA with petrous dura for microvascular decompression (MVD) in-patient with TN or HF caused by TVBA.

**Background:** In trigeminal neuralgia (TN) or hemifacial spasm (HF) caused by tortuous vertebrobasilar artery (TVBA), the traditional technique of MVD involves Teflon for TVBA which can be ineffective and fraught with recurrence and neurological complications. In such cases, there are various techniques of arterioplexy using adhesive compositions, "suspending loops" made of synthetic materials, dural and fascial flaps, surgical sutures passed around or through the vascular adventitia, as well as fenestrated aneurysmal clips.

**Methods:** In severe TN or HF where an MRI of the brain showed, TVBA impinging and compressing the 5<sup>th</sup> or 7<sup>th</sup> & 8<sup>th</sup> nerves complex at nerve exit/entry zone posterior fossa was explored. After craniotomy, TVBA was found impinging and compressing the corresponding nerve entry/exit zone. Arachnoid bands attaching the artery to the nerve complex and pons were released by sharp micro-dissection. The " 'prolenated fascia' or 'fashioned artificial dural patch' " was passed around the compressing portion of TVBA. Both ends of the fascia were brought together and stitched with posterior petrous dura to keep the TVBA away from v or vii& viii nerves and pons.

**Results:** The patient was free of TN or HF immediately after recovery from anesthesia.

Post-operative MRI of the brain showed VA was away from the nerve entry/exit zone

**Conclusions:** 'Prolenated fascia' or 'fashioned artificial dural patch' technique may be a very good option of MVD where the causative vessel is a tortuous vertebrobasilar artery (TVBA).

## Oncology

Oral presentation

Developing a novel prognosis prediction system for surgically treated spine metastases patients based on network-science and correlation analysis

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**Objectives:** The aim of the research was the development of a single-centre database of surgically treated spinal metastatic patients with previously unpublished size in Europe to ensure better knowledge of demographic data and statistically relevant evaluability.

The main goal was to create a new risk assessment system with a reproducible statistical evaluation.

**Background:** During the progress of oncological diseases, there is an increased probability that spinal metastases may develop, requiring personalized treatment options. Risk calculator systems aim to provide assistance in choosing the therapeutic modality by estimating survival chances and classifying patients into prognostic categories.

**Methods:** We created a database by retrospectively processing 454 patients. The prognostic factors were selected via a network science-based correlation analysis which maximizes Uno's C-index, keeping only a small number of predictors. To validate the new system, the D-statistic and Integrated Discrimination Index were also calculated.

**Results:** As a result of multivariate Cox analysis, 5 independent prognostic factors were found to be suitable for the design of the risk calculator, namely primary tumor type, age, mobility status, presence of internal organ metastases, and serum protein level. This new system has a significantly better predictive ability compared to 6 other well-known systems with an average C-index of 0.706 at 10 years (CI95%=0.679-0.733).

**Conclusions:** Accurate estimation of the life expectancy of cancer patients is essential for the implementation of personalized medicine. The proposed scoring system can serve as a reliable guide for clinicians to select suitable patients for surgical care. We are also working on a prospective study to enhance our previous data.

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## Neurovascular Surgery

ePoster presentation

Intracranial internal carotid artery aneurysms: microsurgical management strategies

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**Objectives:** Demonstration of different technical strategies during ICA aneurysm clipping.

**Background:** Even in this time of widely used endovascular therapy for intracranial aneurysms, the utility of microsurgical management of intracranial aneurysms is increasing due to many valid reasons.

**Methods:** In the management of ICA aneurysms, many factors have to be considered to avoid complications and to have successful long-lasting occlusion of aneurysms. Different microsurgical techniques and strategies need to be used. The site, size, atherosclerotic plaque, proximal stenosis, relation with the branches, endovascular failure, the anatomic character of ICA, size of the anterior clinoidal process, etc determine the microsurgical management strategies.

**Results:** Different strategies of clipping techniques in ICA aneurysms have provided safe clipping and positive outcome.

**Conclusions:** Clipping of ICA aneurysms is challenging and it demands skills and different strategies.



## Neurovascular Surgery

ePoster presentation

Supraorbital keyhole approach applied to ruptured ACOM aneurysm clipping: lessons from a resource limited setting

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**Objectives:** - Explore the application of the supraorbital keyhole approach as applied to ruptured ACOM aneurysms  
- Explore technical nuances as applied to ACOM aneurysms  
- Explore patient outcomes following ACOM aneurysm clipping with a supraorbital approach

**Background:** Ruptured cerebral aneurysms present as a neurosurgical emergency with potential for significant morbidity and mortality. Endovascular services are unfortunately not always accessible in a timely manner for patients in resource limited environments. We present our series of ACOM aneurysms treated with a keyhole supraorbital approach in our resource limited setting.

**Methods:** A retrospective review of the authors keyhole ACOM aneurysm series was conducted, analyzing presentation, surgical findings and results.

**Results:** Twenty ACOM aneurysms were treated through a supraorbital keyhole approach. There were 13 female patients and 7 male patients. Fourteen patients presented as WFNS Grades 1 to 3 and six patients presented as WFNS grades 4 to 5. Thirteen of fourteen (93%) WFNS 1-3 patients had a good outcome defined as a mRS Score of 2 or less. Two of Six (33%) WFNS 4-5 patients had a good outcome. Thirteen patients were clipped within three days of rupture. There were 4 deaths in the series, which were all related to complications of subarachnoid haemorrhage. There were four intraoperative aneurysm ruptures and all aneurysms were successfully clipped.

**Conclusions:** The supraorbital approach is a viable keyhole approach for the clipping of ACOM aneurysms. Good patient outcomes can be achieved with this approach for patients presenting with WFNS Grade 1 to 3 ruptures.

## Spine

Oral presentation

Comparative analysis of three types of surgery for lumbar stenosis: open laminectomy, uniportal and biportal endoscopy. (Prospective multi-center study)

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**Objectives:** We intended to identify the benefits and non-inferiority of endoscopic surgery for treating lumbar stenosis in contrast to conventional open laminectomy. In order to achieve this, we attempted to compare various results of each procedure, including laboratory, radiological, and clinical outcomes.

**Background:** For decades, the conventional open laminectomy was the gold standard and has a satisfactory effect on nerve decompression. However, there are problems that require to be overcome regarding surgical complications, including severe bleeding and injury to soft tissues and musculo-skeletal complex. Endoscopic approach has developed over the years to make up for these limitations.

**Methods:** A total of 115 patients were enrolled in the prospective research, which began in February 2019. Our study included seven different centers. Patients were classified into 3 groups according to procedure, and a comparative study was conducted. There were 29 patients in Open, 32 in Uniportal, and 45 in Biportal group. Regarding laboratory data, creatine phosphokinase(CPK), lactate dehydrogenase(LDH), erythrocyte sedimentation rate(ESR) and C-reactive protein(CRP) were assessed. Radiologically, cross sectional area(CSA) and dural expansion of MRI were used to compare the outcome. We obtained several questionnaire related with quality of life to evaluate clinical improvement.

**Results:** On the first and third postoperative day, a significant increase in CPK and LDH was noted ( $p=0.003$ ,  $p<0.001$ ) in the Open group. Postoperatively, sufficient radiological decompression was observed in all groups. Open group ( $345.71\pm 111.74\text{mm}^2$ ) experienced a significantly greater reduction in CSA ( $p<0.001$ ). Most of clinical results improved over all groups. There is less improvement in VAS back pain in Open group ( $p<0.05$ ).

**Conclusions:** The outcome of each surgical technique was similar in terms of improvements in QOL scores and dural space. Nonetheless, muscle preservation is better with endoscopic assisted surgery and resulting in improved postoperative back pain relief. Endoscopic surgery is a reasonable alternative to conventional laminectomy.

## Skull Base

Oral presentation

### Keyhole approaches to meningioma surgery: case series

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**Objectives:** To explore the implementation of keyhole approaches to meningioma surgery.

To explore the feasibility of resecting giant meningiomas through keyhole approaches.

To explore decision making in tailoring a keyhole to specific meningioma locations.

To review the advantage of utilising endoscopy as a sole resection strategy or for endoscopic assistance.

**Background:** Meningiomas comprise one of the most common oncological challenges in Neurosurgery and arise within any intracranial location. Based on the location and size of the meningioma, there are a multitude of potential approaches and philosophies to surgical resection. Keyhole approaches are increasingly gaining acceptance as a philosophical approach to meningioma surgery. This presentation will explore a case series of keyhole approaches as applied to meningioma surgery.

**Methods:** A retrospective review of the authors keyhole meningioma series was conducted, analyzing pathology, approaches and results.

**Results:** 51 keyhole approaches for meningioma resection were conducted. 16 of the 51 meningiomas were sized above 6cm and termed giant meningiomas. 33 patients were female. The supraorbital approach was used in 20 patients, the mini-pterional approach was used in 12 patients, a mini-cp angle approach was used in 8 patients, a tailored mini-parafalx approach was used in 8 patients and an extended endonasal approach in 3 patients. Gross Total resection was achieved in 46 of 51 patients, Near total resection was achieved in 4 patients and subtotal resection in 1 patient. Surgical videos and cases will be presented as illustrative examples.

**Conclusions:** Keyhole approaches to meningioma surgery are a viable operative strategy with a potential for excellent oncological results.

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## Oncology

ePoster presentation

### Case series of giant pituitary tumour resections

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**Objectives:** To explore surgical challenges posed by giant pituitary tumours.

To explore the use of endoscopic endonasal techniques in the setting of giant pituitary tumours.

To explore potential surgical pitfalls in approaching giant pituitary tumours.

**Background:** Endoscopic endonasal techniques have been well established in the realm of pituitary surgery; however, their application to giant pituitary tumours can be a challenging endeavour. This presentation will explore a case series of giant pituitary tumours treated with endoscopic endonasal surgery.

**Methods:** A retrospective review of the authors giant pituitary tumour series was conducted, analyzing techniques employed and results.

**Results:** Twelve patients with giant pituitary tumours, defined as tumours greater than 4cm, were operated upon in the current surgical series. All patients presented with visual acuity deterioration. All 12 patients had endoscopic endonasal resection of their tumour. seven of the patients had an extended endonasal approach with resection of the tuberculum sellae. One patient required a combined supraorbital approach due to lateral compartment extension. A nasoseptal flap was employed in all cases. Gross total resection was achieved in 10 of the 12 cases and near total resection in 2 of the 12 cases. There were two CSF leaks in the series that required subsequent treatment. 9 of 12 patients had improvement in their visual acuity. Surgical videos and cases will be presented as illustrative examples.

**Conclusions:** Giant pituitary tumours can be a significant surgical challenge. Despite their size, advances in extended endoscopic endonasal techniques allow for gross total surgical resection of these lesions with the potential for excellent patient outcomes.

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## Skull Base

ePoster presentation

Endoscopic skull base surgery: exploring indications beyond pituitary surgery

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**Objectives:** - Explore the use of endoscopic techniques in skull base surgery as applied to non-pituitary surgery  
- Review techniques utilised in extended endonasal approaches  
- Review techniques employed in trans-orbital neuroendoscopic surgery

**Background:** Use of endoscopic surgery has been well established in the realm of pituitary surgery resection. As experience with endoscopic techniques has expanded, the indications for endoscopic surgery beyond a use-case for pituitary surgery has also expanded. This presentation will explore a case series of endoscopic approaches and techniques as applied to non-pituitary skull base surgery.

**Methods:** A retrospective review of the authors skull base endoscopic series that excluded pituitary tumours was conducted. Pathology, techniques employed and results were analysed.

**Results:** A total of fifteen cases were included in this series. Cases in the series included 3 extended endonasal endoscopic approaches for craniopharyngioma, 3 extended endonasal endoscopic approaches for meningioma, 3 endoscopic endonasal optic nerve decompressions, 3 Transorbital neuroendoscopic cases for cavernous sinus pathology, 2 endoscopic endonasal orbital decompressions and 1 endoscopic endonasal dacryocystorhinostomy. Surgical videos and cases will be presented highlighting surgical nuances in the applications of endoscopic techniques for the management of these skull base pathologies.

**Conclusions:** The application of advanced endoscopic techniques in the treatment of non-pituitary based skull base pathology allows for surgical access and management of cases that would otherwise be difficult to reach, with traditional open approaches. Neuroendoscopy in this setting, provides a less invasive alternative and has the potential for superior patient outcomes.

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## Skull Base

Oral presentation

Case series and approach to orbital pathology: microscope vs endoscope

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**Objectives:** To present an orbital pathology series.

To explore different pathologies that present within the orbit.

To present different approaches for orbital tumour and lesion resection.

To present both endoscopic and microscopic techniques and review advantages and disadvantages.

**Background:** Orbital pathology is a rare entity and can present as a significant surgical challenge. There can be an array of different pathologies that occupy different orbital compartments and require tailored approaches for surgical resection.

**Methods:** A retrospective review of the authors orbital case series was conducted analyzing pathology, approaches and results.

**Results:** 23 orbital cases were operated upon from 2019 to 2023. 5 en plaque meningiomas, 2 solitary fibrous tumours, 2 meningiomas, 2 lacrimal gland tumours, 2 pseudotumours, 1 optic nerve glioma, 1 invasive squamous cell carcinoma, 4 thyroid eye disease patients, 2 penetrating object extractions, 1 dacryocystorhinostomy and 1 empyema. 16 patients presented with proptosis and 7 patients with visual acuity deterioration. An endoscopic approach was used for 9 cases and a microscopic approach was used for 14 cases. Gross total resection was achieved for 10 out of the 12 tumour based lesions. Surgical management of pseudotumour was a challenge. In patients presenting with visual acuity deterioration, visual acuity improved in 4 of 7 patients. Surgical videos and cases will be presented.

**Conclusions:** Orbital lesions can present as a significant challenge due to their location and relative rarity. By combining both microscopic and endoscopic approaches that are tailored to each individual pathology excellent surgical results can be attained with a high rate of cure.

## Neurovascular Surgery

ePoster presentation

The effectiveness of microvascular decompression and internal neurolysis for trigeminal neuralgia in patients with multiple sclerosis

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**Objectives:** Main objective of this work is to assess the safety, efficacy and durability of open posterior fossa surgery with microvascular decompression, surgical manipulation and/or internal neurolysis of the trigeminal nerve sensory root in a cohort of Multiple Sclerosis (MS) patients with Trigeminal Neuralgia (TN).

**Background:** TN in patients with MS represents a challenging condition that may be treated with surgical or radiosurgical techniques. Multiple studies reported conflicting results regarding the role of surgery in such patients.

**Methods:** We retrospectively reviewed of our TN database searching for TN posterior fossa surgery in MS patients between 2008 and 2019, analyzing medical history, treatment outcomes and complications, focusing on pre-operative and post-operative pain intensities durability of successful pain relief and looking for eventual prognostic role of various perioperative factors.

**Results:** A total of 30 patients were identified. A subgroup of 18 patients was found to have an arterial neurovascular conflict at surgery and underwent microvascular decompression. In the remaining 12 patients in whom a venous conflict or no conflict was found at surgical exploration, arachnoid dissection, coagulation and division of the compressing veins, surgical manipulation and/or internal neurolysis were performed. Overall, rates of pain relief (BNI III or better) at 1, 2, 3, 4, 5 and 6 years were 63, 53, 53, 53, 34 and 34%, respectively. At each time point, no significant difference was found between arterial compression patients and patients where a veins coagulation and division, surgical manipulation and internal neurolysis were performed. No prognostic factor related to successful outcome were identified. Almost all patients undergoing internal neurolysis experienced some degree of facial numbness.

**Conclusions:** This study shows that open posterior fossa surgery with microvascular decompression, vein coagulation and division, surgical manipulation and/or internal neurolysis of the trigeminal nerve sensory root is a well-tolerated, effective and fairly durable treatment for TN in MS patients.

## Oncology

ePoster presentation

### Glioblastoma resection - a connectomic approach based case series

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**Objectives:** Review surgical strategies for the treatment of glioblastoma.

Review how connectomic and tractographic data can guide pre-operative planning.

Review how connectomic data can provide valuable information about the relationship of eloquent cortex to the tumour.

Review surgical techniques that will aid in gross total resection of glioblastoma.

**Background:** Glioblastoma Multiforme remains a devastating disease with universally poor outcomes. Gross total resection has been established as providing survival advantage; however, gross total resection, at the expense of eloquent neurological function needs to be carefully balanced on a case by case basis.

**Methods:** A retrospective review of the authors glioblastoma series employing connectomic data was conducted. Analysis of presentation, tumour location, tracts involved, surgical outcomes, resection rate and survival was undertaken.

**Results:** Thirty two patients with glioblastoma were operated upon utilising a connectomic based approach. All patients had MRI Diffusion imaging and resting state fMRI prior to surgery. Tractography was undertaken and resting state networks were analysed prior to surgery. There were 14 female and 18 male patients. The majority of patients presented with headaches, seizures and loss of neurological function. Eight tumours were located in the frontal lobe, seven in the temporal lobe, eight in the parietal lobe, four in the insular lobe and five in the occipital lobe. Keyhole approaches were applied to 24 cases, awake craniotomy was utilised in four cases and neuromonitoring in eleven cases. Gross total resection was achieved in twenty-six cases (81%), near total resection in four cases (12.5%) and subtotal resection in two (6%) of cases. Seven transient and two long-term surgically related deficits arose in the series.

**Conclusions:** Connectomic analysis prior to glioblastoma resection enhances three dimensional understanding of tumour positioning and alerts the surgeon to eloquent areas in the surrounding vicinity of the tumour. This allows for safer surgical planning and assists in achieving gross total resection.



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## Neurovascular Surgery

ePoster presentation

Microsurgical clipping of multiple aneurysms (one sided Sylvian fissure to other side) through single craniotomy: video presentaion

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**Objectives:** To share the experience with video presentation of microsurgical clipping of multiple aneurysms through single craniotomy.

**Background:** About 22-30% of the intracranial aneurysms are multiple.

**Methods:** Retrograde review of cases.

**Results:** Multiple aneurysms even on the contralateral Sylvian fissure were clipped safely and successfully.

**Conclusions:** In a relaxed brain, multiple aneurysms even in the contralateral lateral sulcus can safely be clipped.

## Spine

ePoster presentation

### Validity of the Hungarian patient-reported outcomes measurement information system (PROMIS)-29 profile among patients with low back pain

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**Objectives:** In this study, we perform the psychometric analysis of the Hungarian version of Patient Reported Outcomes Measurement Information System (PROMIS®)-29 Profile domains among patients with low back pain.

**Background:** Low back pain is the leading cause of disability globally. Patient reported outcome measurements show the clinicians health related quality of life. The use of these questionnaires could help therapeutic decision making process in the future. PROMIS-29 is a short toll including seven health domains that could be used in spine surgery in the future. We Would like to validate this questionnaire in order to apply it in the clinical practice.

**Methods:** Participants completed PROMIS-29 Profile alongside validated legacy questionnaires - Oswestry Disability Index, Research and Development (RAND)-36, General Anxiety Disorder-7 scale, Patient Health Questionnaire-9 scale. Reliability was evaluated by calculating internal consistency (Cronbach's  $\alpha$ ). Test-retest reliability was assessed using intraclass correlation coefficient. We used confirmatory factor analysis to show structural validity. Construct validity was assessed by evaluating convergent and discriminant validity using Spearman's rank correlation and by performing known-groups comparisons.

**Results:** Mean (SD) age of the 131 participants was 54 (16), 62% were female. Internal consistency of each PROMIS domain was high (Cronbach's  $\alpha > 0.89$  for all). Test-retest reliability was excellent (ICC  $> 0.97$ ). Confirmatory factor analysis showed good structural validity (CFI  $> 0.96$ , RSMR  $< 0.026$  for all domains). All measured PROMIS scores strongly correlated with the corresponding primary legacy instrument, indicating excellent convergent validity.

**Conclusions:** We present data supporting the validity and reliability of the Hungarian PROMIS-29 Profile short forms in patients with low back pain. This instrument will be useful for research and clinical applications in spine care.

## Neurovascular Surgery

ePoster presentation

The role of microvascular decompression in trigeminal neuralgia in a large mono-institutional cohort comprehending multiple sclerosis patients: long-term clinical results

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**Objectives:** To evaluate the effectiveness and long term pain relief of microvascular decompression (MVD) for trigeminal neuralgia (TN), including patients affected by multiple sclerosis (MS).

**Background:** The exact role of MVD for TN, especially in MS patients still need to be elucidated.

**Methods:** 516 patients (214 males - 302 females) from 23 to 87 years (with a single 12yo pediatric patient), including 32 patients with SM, underwent MVD surgery, in a period between January 2011 and December 2022 in the Department of Neurosurgery of the "Istituto Neurologico C. Besta" in Milan (Italy). 488 patients underwent at least a 1-year clinical follow-up. For the remaining 28 patients last follow-up carried forward was considered. Ten surgeons with different age and experience performed the operations.

**Results:** Neurovascular compression was found in all cases during surgery.

Complete pain relief was overall achieved in 404 patients (78,29%); Incomplete pain relief was obtained in 100 cases (19,37%) and 12 patients (2,32%) did not benefit from the procedure. Complete pain relief was achieved in 21 out of 32 patients with MS (65,62%) and in 383 out of 484 patients without MS (79.13%). There was no mortality and the complication rate (from very mild to severe) was 23,06%. The re-operation rate for complications was 6% and the reoperation rate for TN recurrence was 12,98%. Radiofrequency thermal rhizotomy, percutaneous balloon compression, Cyber-Knife or new MVD were the methods used for re-operations.

**Conclusions:** MVD may be considered an effective and safe surgical technique for TN, although the appropriateness of such procedure in MS patients is still under debate; the complete relief rate at one-year follow-up in our cases was of 65,62%, but larger studies focusing on the relation of such comorbidity with neurovascular compression are required.

## Trauma

ePoster presentation

### Anterior sacral meningocele

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#### Objectives:

- To report 2 cases of anterior sacral meningocele
- To review the literature of this rare disease and to reach a consensus on management

**Background:** ASM is a rare disorder that was first described by Bryant in 1837. Only 183 cases have been reported from 1837-1991 & 24 cases have been reported from 1990 -2000. In children, it presents with Currarino's triad- ASM, anorectal anomalies and sacral defects. It is even rarer in adults and are asymptomatic. Both the cases that we encountered were found incidentally.

**Methods:** Case 1: 25 year old antenatal mother with 3 months of amenorrhoea was diagnosed to have ASM during Antenatal scans. Though initially planned for termination of pregnancy & repair of meningocele, after the review of literature, we took a conservative approach. Patient delivered a full term baby through LSCS and is under follow up for past 1 year.

Case 2: 28 year old female , a mother of 2 children presented with lower abdominal pain. Scans revealed an ASM along with ovarian cyst. Pain was attributed to ovarian cyst and patient is on follow up.

**Results:** Our literary search in PUBMED revealed a total of less than 220 cases that are reported. Very few of them are adults. Most symptoms in adults are due to compression on other nearby organs. Neurological symptoms are rare. Both anterior and posterior approaches have been described for the excision of ASM. Conservative measure can be recommended in Asymptomatic adult patients.

**Conclusions:** ASM in adults seldom seem to progress and in completely asymptomatic, can be managed conservatively.

## Skull Base

Oral presentation

### Predictors of central diabetes insipidus after endoscopic transsphenoidal surgery of pituitary adenoma at a tertiary hospital in the Philippines

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**Objectives:** To describe the risk of central diabetes insipidus of patients who underwent endoscopic transsphenoidal surgery for pituitary adenomas.

**Background:** Postoperative central diabetes insipidus is a common complication after endoscopic endonasal transsphenoidal surgery. Numerous factors are potentially associated with development of central diabetes insipidus have been published from other countries. This paper aims to review our single-institution's experience and association of candidate predictors to postoperative central diabetes insipidus of patients with pituitary adenomas after endoscopic endonasal transsphenoidal surgery.

**Methods:** We studied 62 consecutive patients with biopsy-confirmed pituitary who were admitted at two hospitals under one system (Section of Neurosurgery, St. Luke's Medical Center Quezon City and Global City, Metro Manila, Philippines), where they underwent endonasal transsphenoidal excision for the adenoma between January 2012 to September 2020. We performed a univariate analysis to assess the relationships between each variable and diabetes insipidus by using a binary logistic regression. We also performed a multivariate statistical analysis of factors related postoperative diabetes insipidus by using a multiple logistic regression.

**Results:** In univariate analysis there were several variables which had significant relationship ( $p < 0.05$ ): preoperative urine specific gravity ( $p = 0.001$ ), preoperative serum hypernatremia ( $p = 0.00$ ), preoperative tumor volume ( $p = 0.006$ ), operative time ( $p = 0.001$ ), blood loss ( $p = 0.035$ ), postoperative urine specific gravity ( $p = 0.00$ ) and postoperative serum hypernatremia ( $p = 0.005$ ).

In multivariate analysis, the following variables did not show significant relationship: preoperative urine specific gravity ( $p = 0.99$ ), preoperative serum hypernatremia ( $p = 0.99$ ), preoperative tumor volume ( $p = 0.34$ ), operative time ( $p = 0.396$ ), blood loss ( $p = 0.537$ ), postoperative urine specific gravity ( $p = 0.99$ ) and tumor pathology ( $p = 0.545$ ).

**Conclusions:** The laboratory, radiologic, surgical and pathologic variables investigated showed significant relationship in the univariate analysis but failed to show relationship in the multivariate analysis. Different factors such as sample size and completeness of records may have contributed to this result. A multicenter prospective design with a larger population is recommended for further study.

## Skull Base

ePoster presentation

Independent radiologic and surgical predictors of tumor progression of pituitary adenomas after endonasal transsphenoidal surgery: a multivariate analysis

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### Objectives:

To develop a preliminary multivariate model for prognosis to predict the risk of tumor progression of patients who underwent endonasal transsphenoidal surgery for pituitary adenomas.

### Background:

Over the last four decades, the preferred treatment of choice of pituitary adenomas has been endonasal transsphenoidal surgery. The advantage of this type of surgical technique is the immediate relief of signs and symptoms and lower complication rate. Tumor progression after subtotal removal of pituitary adenoma is well recognized, but the clinical predictive factors associated with progression have not been studied. To the best of our knowledge this is the first study in the Philippines to determine independent predictors that contribute to tumor progression after endonasal transsphenoidal surgery.

### Methods:

A total of 55 consecutive patients who underwent surgery for pituitary adenomas were included in this study. Univariate analysis was performed on the patients with and without progression. Candidate radiologic and surgical predictors were determined a priori based on available literature and authors' consensus. Multivariate Cox proportional-hazards regression was used to build the preliminary prognostic model.

### Results:

Fourteen patients (25.5%) experienced tumor progression, where 41 patients (74.5%) did not. The final multivariate model had a model Wald  $\chi^2$  (6, N = 41) = 16.904, p = .010. It included the following independent predictors: 1) T2-weighted imaging hyperintensity (HR = 0.007; 95% CI of 0; 0.183, p = .003), 2) operative time (HR = 2.905; 95% CI of 1.168, 7.228; p = .022), 3) postoperative diabetes insipidus (HR = 14.491; 95% CI 1.374, 152.814; p = .026), and 4) PTV (HR = 0.412; 95% CI of 0.234, 0.726; p < .002).

### Conclusions:

The aforementioned variables and their interactions produced a significant preliminary model to estimate time to tumor progression of our patients who undergo endonasal transsphenoidal surgery for pituitary adenomas. This model needs to be externally validated by a prospective study.

## Trauma

Oral presentation

**Predictors of recurrence among adult Filipinos after chronic subdural hematoma surgery: developing a preliminary model for prognosis**

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**Objectives:** To create a preliminary model to estimate the probability of recurrence in a CSDH patient who has undergone surgery.

**Background:** By creating our own predictive model from the analysis of demographic, clinical, radiologic and surgical parameters, we can create a more accurate risk profile for our patients and enhance our capability to prognosticate CSDH patients in a developing country.

**Methods:** This is a retrospective cohort of 71 adult patients who underwent CSDH surgery at a tertiary medical center in the Philippines. The outcome of interest was recurrence of CSDH detected on postoperative scans after discharge. Candidate predictors were chosen a priori based on our institution experience and available literature. Multivariate logistic regression analysis was performed to determine the final model guided by Akaike Information Criteria and receiver operating characteristic curve criteria.

**Results:** A total of 71 adult patients underwent CSDH surgery. Seven had recurrence. Four patients underwent repeat CSDH surgery and three were managed conservatively. The analysis revealed that bilateral surgery (OR = 0.06; SE 1.35; 95% CI of 0.01, 0.78; p = .032), intraoperative Tranexamic acid (OR = 0.03; SE 1.68; 95% CI of 0.01, 0.87; p = .042), and length of hospital stay (OR = 1.18; SE 0.08; 95% CI of 1.01, 1.41; p = .032) were independently associated with CSDH recurrence. The final model was significantly better at predicting recurrence compared to baseline probability (Wald  $\chi^2$  (6, N = 71) = 18.427, p = .005). The model had good sensitivity and specificity in predicting recurrence (AUC = 0.911; SE 0.054; 95% CI of 0.806 to 1.000; p < .001). A Youden's index Jmax = .716 corresponds to a predicted probability of 0.171 (Sn = 85.7%, Sp = 85.9%, PPV = 40.0%, NPV = 98.2%).

**Conclusions:** The authors have developed a preliminary model predicting recurrence after surgery for our institution.

## Skull Base

ePoster presentation

### Patient characteristics and clinical outcomes of endoscopic endonasal transsphenoidal surgery for pituitary macroadenomas at a tertiary hospital in the Philippines

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**Objectives:** To describe the patient characteristics, clinical outcomes and tumor progression of Single Nostril Endoscopic Endonasal Transsphenoidal Surgery for Pituitary Macroadenomas at our institution.

**Background:** Pituitary macradenomas are benign brain tumors frequently diagnosed in a patient with headache, visual loss or endocrine disturbances. Throughout the years, neurosurgeons have continued to develop the use of endoscopic and microsurgical approach to pituitary tumors and studies have been made comparing the two approaches regarding surgical and clinical outcomes. The single nostril technique was compared to the two-nostril technique and the clinical outcomes were documented to be similar.

**Methods:** This is a cross-sectional descriptive retrospective study where data were obtained by chart review of patients seen at a single tertiary center from January 2014 to December 2019. All patient underwent excision by Endonasal Transsphenoidal Surgery. Descriptive statistics was used to describe the patients' characteristics. Changes in endocrinologic laboratory values pre- and post-operatively were compared using paired t-test and Wilcoxon tests. Kaplan-Meier survival analysis was used to estimate time of local tumor control and progression of pituitary macroadenomas.

**Results:** In our study, 54 (83%) of the patients underwent Single Nostril Endoscopic Endonasal Transsphenoidal Surgery (SN), 6 (9%) underwent Bi-nostril Endoscopic Endonasal Transsphenoidal Surgery (BN) and 5 (8%) for Microscopic Transsphenoidal Surgery (MT). There is no significant difference among the 3 groups. The SN group has the shortest operative time (2.5 hours,  $p=0.024$ ) and is significantly less compared to the BN group.

**Conclusions:** It is difficult to generalize the most superior among the techniques discussed, however this study presented valuable information regarding clinical outcomes of single nostril approach. This transsphenoidal approach is similar to other techniques in terms effectiveness of removal of tumor and considering that the it can be done in a significantly shorter operative time, it is a good option in the surgical management of pituitary macroadenomas.



## Paediatric

Oral presentation

Long term anthropometric and cosmetic outcomes following flexible endoscope assisted suture release for isolated sagittal synostosis

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**Objectives:** We have previously described our technique and short term anthropometric outcomes following flexible endoscope assisted suture release (FEASR). Herein we present our long term anthropometric results.

**Background:** The aim of this study was to determine if good long term anthropometric outcomes could be maintained following FEASR for isolated sagittal craniosynostosis.

**Methods:** Records were retrospectively reviewed for children with isolated sagittal synostosis who underwent FEASR between March 2018 and June 2022. The operative procedure consisted of flexible endoscope assisted strip craniectomy and bilateral barrel stave osteotomies. All patients underwent post-operative cranial orthotic helmet therapy. Serial anthropometric data was collected preoperatively, at 6 weeks, 6 months, 12 months, 24 months and 36 months postoperatively.

**Results:** A total of 44 consecutive patients were enrolled. The mean age at the time of surgery was 3.1 months. The mean preoperative cephalic index was 66.8. The follow up period ranged from 12 to 36 months (mean 25,2 months). To date 27 patients have been followed up to 24 months and 18 patients to 36 months. Mean cephalic index at 6 weeks postoperatively was 77.8 ( $p < 0.01$ ), an 11% improvement from the preoperative CI. A maximum post-operative mean cephalic index of 78.1 was reached at six months, an 11.3% improvement. There was a gradual decline in CI to 76.3 by 36 months, a still significant 9,5% improvement compared to the mean preoperative CI. The change of mean CI from 6 months to 36 months was -1.8%. During this time period one patient required reoperation for a persistently unacceptable midline skull defect.

**Conclusions:** The anthropometric and cosmetic outcomes of FEASR are maintained for an extended period with no significant regression in cephalic index over time. The long term outcomes of FEASR appear similar to procedures conducted via traditional rigid endoscopy.

## Paediatric

ePoster presentation

### Epstein-Barr virus-associated smooth muscle tumor involving the spine of an HIV-infected paediatric patient: a case report

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**Objectives:** We present a rare case of an HIV-infected paediatric patient with primary EBV-associated SMT of the spinal column, treated surgically.

**Background:** Epstein-Barr virus-associated smooth muscle tumor (SMT) is a rare tumor that occurs in immunocompromised patients, including HIV-infected-, post-transplant-, and congenitally immunodeficient patients.

**Methods:** A nine year old female, newly diagnosed with human immunodeficiency virus, presented with neck pain and left upper extremity anaesthesia. Magnetic resonance imaging (MRI) revealed a circumferential left foraminal lesion extending from C4 to C5 and a smaller left paraspinal lesion at the same level.

**Results:** Both spinal masses described were successfully surgically excised. The patient was already started on highly active antiretroviral therapy (HAART) preoperatively, and adjuvant radiotherapy was initiated postoperatively. Follow-up imaging revealed complete resolution of the lesions. Histopathology of these lesions demonstrated a spindle cell infiltrate showing an intersecting fascicular growth pattern, with positivity for EBV-encoded RNA (EBER) in-situ hybridization.

**Conclusions:** EBV-associated SMTs are uncommon. However, inclusion in the differential diagnosis of AIDS patients is vital, due to their variable aggressiveness, particularly those with smooth muscle tumors in unusual locations such as the spine. Treatment guidelines for incidences where SMTs involve the spine, have yet to be established. It is advisable that these patients be managed with surgical resection and radiotherapy when possible to relieve acute neurologic symptoms. In addition, patients diagnosed with these rare tumours must be included in further case reports, and further systematic reviews of this condition are required in the effort to develop an evidence-based management plan for this exceedingly rare condition.

## Spine

Oral presentation

Navigation in spinal surgery: nice to have or essential

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**Objectives:** The advantages of spinal navigation are well known, and extensively published over the last 20 years. The arguments against navigation were cost of implementation, increase of surgical time, and a long learning curve. Recently studies have shown the cost effectiveness of navigation and robotic surgery, when redo surgery is taken into account to be a positive aspect. Navigation decreases surgical time, not just in placement of instrumentation, but also by planning approaches and extent of surgery.

With the accuracy being shown to be near to perfect, it has become a issue whether a surgeon will be seen as medical legally negligent if this technology is not used.

With Minimal Invasive Surgery becoming the norm in surgery, and being pushed by the patient, industry and surgeon, the use of navigation will become more advantageous.

The use of navigation in daily surgery are being advocated by many surgeons, and it is not just used in placing instrumentation, but in planning surgery, as well as tracking all tools, and even the surgery itself.

Studies with robotic surgery vs free hand surgery has shown that the patient has a 5 times higher risk of complications in the free hand group and a 10 times higher likelihood of having revision surgery in the first year if computer guidance is not used.

A medline search was done, and all the pros and cons of navigation will be shown, as well as examples advantages in daily usage.

**Background:** Spinal navigation is disregarded by most surgeons, even with overwhelming evidence of superiority.

**Methods:** A medline search has been done on results of fluoro, navigation, computer assisted navigation and robotic surgery.

**Results:** Navigation has been shown to be statistically superior in all measured aspects vs free handed surgery with fluoro.

**Conclusions:** Navigation in spinal surgery is an essential part.

## Oncology

ePoster presentation

Characteristics and clinical outcomes of pediatric malignant brain tumor patients in a tertiary hospital in the Philippines during COVID-19 pandemic

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**Objectives:** The goal of this study is to compare at a local scale in a developing country the known impact of COVID-19 to pediatric brain tumors.

**Background:** Brain tumor is the second most common malignancy in childhood, representing 20-25%. The most common pediatric brain tumor in the Philippines is Astrocytoma followed by Medulloblastoma.

**Methods:** This is a descriptive and retrospective 3-year review covering January 2020 to December 2022. Review of patient records and electronic database was done to collect data. Data includes Age, Sex, COVID-19 status, classification of intracranial tumor, surgery done and clinical outcome.

**Results:** A total of 37 patients with pediatric intracranial tumor were admitted at St. Luke's Medical Center Global City and Quezon City from January 2020 to December 2022 during the COVID-19 Pandemic period. 18 patients (49%) are malignant and 19 patients (51%) are benign. Among the 18 malignant tumor cases, 10 (55%) are Germ Cell Tumors, 5 (28%) are Glioblastoma multiforme, 1 patient (0.5%) with choroid plexus carcinoma, 1 patient (0.5%) with CNS lymphoma and 1 patient (0.5%) with Diffuse intrinsic pontine glioma. Among the reported malignant cases, the mortality rate is 22% (4 out of 18). 20 out of the 37 cases (54%) had surgery from increased intracranial pressure from mass effect and hydrocephalus. Only 2 pediatric brain tumors were COVID positive from RT-PCR test, none died from complications of COVID.

**Conclusions:** The number of admitted patients and the mortality rate with pediatric malignant intracranial tumors during the COVID-19 pandemic in the Philippines remained constant. Adjustments were made considering the quarantine protocols during admission, proper screening and health protocols in the operating room for surgical patients, follow up check-ups, both in-patient and outpatient delivery of chemotherapy. A nationwide study will be beneficial to conclude the overall impact of COVID-19 pandemic to pediatric brain tumors in the Philippines.

## Oncology

ePoster presentation

Surgical outcome of meningioma in a private practice setting: a comprehensive analysis by an early career neurosurgeon

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**Objectives:** The study aimed to evaluate postoperative outcomes, complications, and recurrence associated with meningioma resection within the context of a private practice environment by an early career (<10 yrs) neurosurgeon.

**Background:** Meningiomas, being the most common primary intracranial tumors, necessitate meticulous surgical management to achieve favorable patient outcomes.

**Methods:** A retrospective analysis was performed on a cohort of meningioma patients who underwent surgical resection at a private neurosurgical practice between April 2014 to March 2023 at Bhubaneswar, Odisha, India. The study scrutinized various factors, including patient demographics, tumor characteristics, surgical approaches, extent of resection, intraoperative complications and recurrence rates.

**Results:** A total of 50 Meningiomas operated by an early career neurosurgeon in private practice were included in the study. The average age of patients was 53 years (range 28-85). The M:F distribution was 3:2. Parasagittal and parafalcine meningiomas were the majority of cases (n=17, 34%) followed by sphenoid wing Meningiomas (n=13, 26%). The average Tumor size was 3.5 cm (range 1.5 cm - 6 cm) in largest dimension. Tailored craniotomy was the most common surgical approach (n=48, 96%). GTR (Simpson's Grade 2) excision was achieved in 90% (n=45) cases. Postoperative Complications were : venous infarcts 6% (n=3), haematoma 2% (n=1), CSF leaks 4% (n=2), New onset neurological deficits 4% (n=2). There was 1(2%) postoperative mortality. Histopathology was WHO grade 1 Meningioma in (n=48, 96%) cases. The mean follow up duration was 46 mo (range 3mo - 120 mo). Recurrent tumours occurred in 8.8% (n=4) cases of GTR group who were subjected to second surgery. 50% (n=2) of the recurrent tumours were in parasagittal location.

**Conclusions:** The results are comparable to available data. With due diligence the surgical outcomes do not differ based upon practice setup. The findings provide valuable insights for other early career neurosurgeons practicing in private settings, reinforcing the significance of expertise & patient-tailored approaches.

## Neurovascular Surgery

ePoster presentation

### Preoperative embolization as a strategy to mitigate hemorrhage risk in surgical resection of spinal hemangioblastomas

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**Objectives:** This study aims to explore the interest and indications of preoperative embolization as an adjunctive technique to mitigate hemorrhage risk during surgical resection of spinal hemangioblastomas

**Background:** Spinal hemangioblastomas are benign vascular tumors that pose a surgical challenge due to the risk of intraoperative hemorrhage. The standard treatment for these tumors is surgical resection, but the potential for significant bleeding necessitates additional strategies to enhance safety.

**Methods:** A comprehensive literature review was conducted using reputable databases, including PubMed and Medline in May 2023. Studies focusing on the surgical management of spinal hemangioblastomas and the use of preoperative embolization were reviewed. The emphasis was placed on evaluating the benefits and indications of preoperative embolization in reducing hemorrhage risk during surgical resection. The search terms used were "Hemangioblastoma," "haemangioblastoma," "spinal cord," and "embolization".

**Results:** In our review, a total of 17 studies met our criteria, encompassing 69 patients. The age range varied from 16 to 71 years. Common symptoms at the time of diagnosis included progressive back pain with radiculalgia, motor deficits, urinary disturbances, and hyperreflexia. The cervical region was the most frequent site of involvement (66.7%), followed by the thoracic region (15.9%). The majority of cases had tumors larger than 3 centimeters. The time interval between embolization and surgery ranged up to four months. Total tumor resection was achieved in most patients, except for one case. Among the 69 patients, 61 patients (88.4%) experienced less bleeding than expected.

**Conclusions:** Preoperative embolization of hemangioblastomas is a useful technique that can make surgical resection safer and more effective. We recommend considering it after multidisciplinary consultation involving neurosurgeons and interventional neuroradiologists.

## Trauma

Oral presentation

### Managing traumatic spine in LMIC – challenges and development

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**Objectives:** To assess the feasibility and efficacy of spine surgery in Tanzania.

**Background:** Trauma including traumatic spine is becoming the leading cause of morbidity and mortality in LMIC countries. The spine surgery is often expensive due to implants use and rehabilitation is often a lifetime exercise leading to non-surgical spine care a popular option for care of spine trauma in LMIC.

**Methods:** A feasibility study was performed to procure a donation of implants and cohort of spine trauma was established. The in-hospital and one month outcome data was collected between the two cohorts and the results were analyzed for presentation.

**Results:** Between 2017 and 2021 a cohort of 617 traumatic spine patients were admitted at a single institution. Among those 331 received surgery and were discharged home safely. Interval from admission to surgery was reduced from 31 days to 5 days. Mortality was high in cervical spine than thoracolumbar segment. Most cervical spine patients demanded an ICU care and inotropic drugs. The rate of spine surgery dropped sharply after spine implants donation stopped. The rate of spine surgery was less in public patients than in private or health insured ones. the rate of in-hospital complication was higher for non-surgical group. Generally, it was cost effective to introduce spine surgery than non-surgery.

**Conclusions:** Spine surgery is feasible and cost effective but associated with many challenges in LMIC.

## Paediatric

Oral presentation

Towards better definition of a resection strategy in pediatric LEATs causing refractory epilepsy

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**Objectives:** Resection strategy in pediatric long-term epilepsy associated tumors (LEATS) may consist of pure lesionectomy, ECoG guided tailored resection or even partial/complete lobectomy.

**Background:** To propose an evidence based appropriate surgical strategy, we retrospectively analysed our consecutive institutional series of surgically treated pediatric LEATS.

**Methods:** Twenty-two children (mean age 8 yrs, from 2-18) suffering from medically intractable seizures for 30 months mean (from 3 to 201) harbouring suspected LEATs were investigated at the pediatric epilepsy monitoring unit using clinical and video EEG monitoring, extended MRI epilepsy protocol and Fluorodesoxyglucose (FDG) and Methionine (MET) PET imaging. In 17/22 patients ECoG was used for intraoperative pre-and postresection EEG.

**Results:** Lesions were located in the temporal lobe in 15 patients and extra-temporally in 7 patients (2 parietal, 3 frontal and 2 occipital). Preoperative MRI contrast enhancement was present in 10 out of 20 GG (50%) and FDG PET showed a hypo-metabolic area in 6 GG (27%). MET PET uptake was found in all but one tumor. In temporal LEATS, mainly antero-temporal resections or temporal lobectomies were performed (15 patients), whereas in extratemporal LEATS lesionectomies or tailored resections guided by ECoG were achieved (7 patients). Histological diagnosis was GG in 20 and DNET in 2 patients. In temporal resections, ILAE Class 1 seizure outcome was achieved in 75%, which was improved to 94% ILAE Class 1 by performing 6 repeat surgeries with antero-temporal lobectomies after unsuccessful lesionectomies. The extratemporal patients experienced ILAE Class 1 seizure outcome in 86% without additional surgeries (mean follow-up 28 months).

**Conclusions:** In childhood LEATs amino acid PET was found to have high diagnostic sensitivity for GGs. In surgical therapy, for extratemporal LEATs a pure lesionectomy or tailored resection may be an appropriate strategy. On the contrary, for temporally located LEATs an antero-temporal resection or even temporal lobectomy may be necessary to achieve seizure freedom.



## Paediatric

Oral presentation

### Intraoperative high field MR (3Tesla) imaging for epilepsy and tumors in pediatric neurosurgery

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**Objectives:** Intraoperative high field MR (3 Tesla) imaging is a challenging task, especially when used in children. On the other hand, advantages on prognosis may be significant, especially in pediatric epilepsy and tumor surgery.

**Background:** To investigate possible advantages in our pediatric epilepsy and tumor patients, we searched our intraoperative MRI database to identify all children operated on at the Neurosurgical Department, Vienna Medical University during the last 28 months.

**Methods:** Altogether, 124 children (8.7 years mean, from 0-18 years, 60 female) in 148 surgeries were operated on using the 3 Tesla intraoperative MRI suite. Of those, 81 epilepsy surgeries (patients median age 6, 0-16) and 67 tumor surgeries (patients mean age 8, 0-18) were performed.

**Results:** The epilepsy surgery cases consisted of 27 disconnections, 23 resections, 18 electrode implantations, 12 LITT procedures and 1 VNS. For the tumor cases, 36 supratentorial resections, 22 infratentorial resections, 5 stereotactic biopsies, 1 LITT, 1 AVM, 1 ommaya and 1 orbital Tu were performed in the iop MRI suite. Intraoperative assessment of the extension of lesional epilepsy (FCDs, LEATS, Cavernomas) and tumor borders were feasible in every case. Due to the intraoperative MR imaging results, second look surgeries were performed in 27% of the cases, dependent on the specific diagnosis. Highest numbers of second look surgeries were performed in diffuse gliomas and in FCDs. Additionally, intraoperative diffusion tensor imaging (DTI) was applied to ensure complete fibre disconnection in epilepsy surgery. No adverse effects like intraoperative anaesthesia instability or postoperative infection occurred.

**Conclusions:** Intraoperative high field MRI in pediatric neurosurgery (especially in epilepsy and tumor surgery) seems to be beneficial in increasing extent of resection at least in 20-30% of the cases and may thus contribute to improve outcome in pediatric tumor and epilepsy cases.

## Oncology

ePoster presentation

### Transcallosal approach for IIIrd and lateral ventricular tumors

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**Objectives:** Transcallosal approach belongs to important neurosurgical approaches and is being used mainly for the processes of the IIIrd and lateral ventricles. The approach might be used either for extraaxial ventricular tumors but also for intraaxial tumors like thalamic gliomas.

**Background:** The approach has its peculiarities and risks – injury of pericallosal arteries or venous congestion from cutting the bridging veins or the fornix injury. In this paper we discuss the technical aspects of this approach as well as the treatment results.

**Methods:** During 2005 to 2022 we used this approach in 43 patients with histologically diverse lesions. The most frequent were thalamic pilocytic astrocytomas (12 patients) and 7 craniopharyngeomas. There were 6 colloid cysts, 3 metastases, 3 glioblastomas, 2 subependymomas, 2 germ cell tumors and one ependymoma, schwannoma, cavernoma, plexus papilloma, ganglioglioma, diffuse low grade glioma, anaplastic pleomorphic xanthoastrocytoma and subependymal giant cell astrocytoma.

**Results:** Tumor was totally removed in 20 cases, 14-times the resection was subtotal (more than 90%) and in 8 patients there was only partial resection (less than 90%). 28 patients had a good treatment results, in 7 cases there was a transient neurological deficit (2 cases of mild hemiparesis and 3 cases of a transient memory deficit) and 5 cases of permanent neurological deficit (severe hemiparesis). One patient after a partial resection of a metastasis died due to a hemocephalus.

**Conclusions:** Transcallosal approach should belong to an armamentarium of a neurosurgeon dealing with ventricular tumors and other midline tumors. There are situations where the use of transcallosal approach seems to be a really the best option, specifically compared to transcortical approaches. It is necessary, however, to take into consideration the risks of this approach, mainly the damage to venous system and the fornices.

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## Spine

Oral presentation

Surgical strategies in complex craniovertebral junction anomalies: lessons learnt

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**Objectives:** To elucidate various surgical strategies in complex Cranio-vertebral junction anomalies cases.

**Background:** Despite the advancement of technology and surgical techniques, posterior C1-2 fusion is still a technically challenging procedure given the complex bony and neurovascular anatomy in the craniovertebral junction (CVJ). In addition, vascular and bony anomalies in this region are not uncommon and can lead to devastating neurovascular complications if unrecognized. Thus, it is important for spine surgeons to be familiar with various posterior atlantoaxial fusion techniques apart from C1- C2 fixation alone.

**Methods:** All patients of CVJ anomaly in whom straightforward C1-C2 fixation was not possible owing to bony and vascular anatomical variations are included in this study.

**Results:** Out of 300 patients treated for CVJ anomaly, C1-C2 fixation was not possible in 56 patients and various hybrid fixation techniques were adopted.

**Conclusions:** It is important to understand the preoperative anatomy in CVJ anomalies and decide the type of fixation needed. C1-C2 fixation alone is not possible in all cases, so one should be aware of all fixation and reduction techniques needed to treat this complex entity.

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## Spine

ePoster presentation

### Postoperative discal pseudocyst: a case report and literature review

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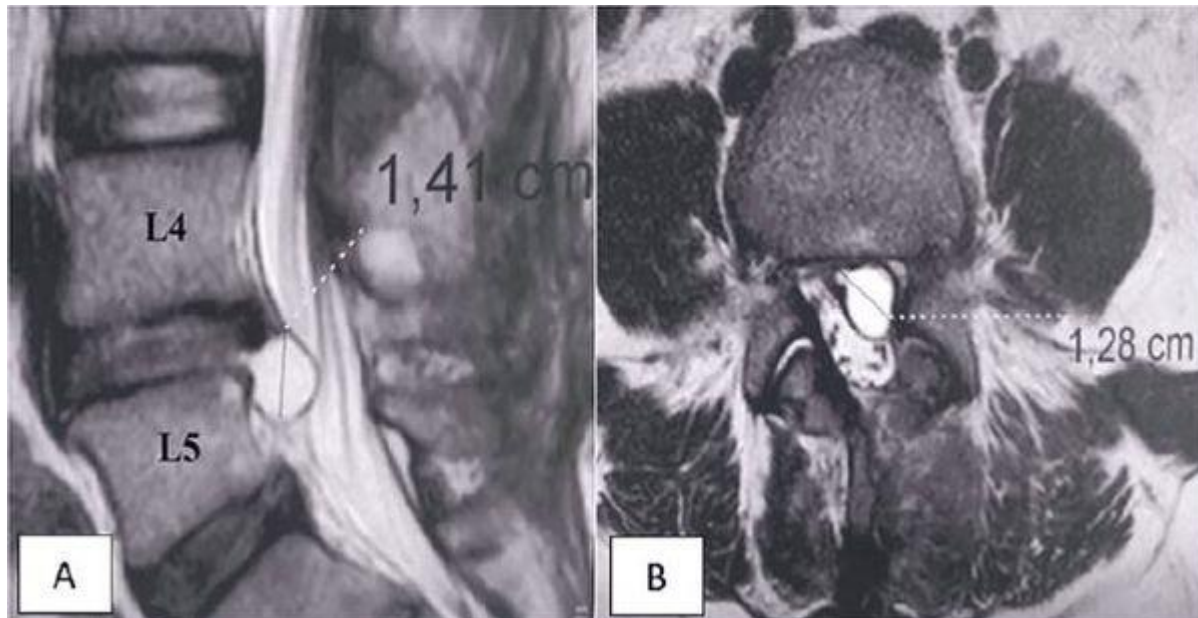
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**Objectives:** We report the case of early detection of a PDP treated by surgery, with a review of the literature.

**Background:** The postoperative discal pseudocyst is a rare complication of lumbar disc herniation surgery. The mean time from surgery to PDP detection by MRI ranged from 23.3 days.

**Methods:** We report the case of a 43-year-old female patient with a history of recent surgery for a herniated lumbar disc at L4-L5, 2 months ago. The postoperative course was simple at the hospital. We had readmitted her with radiculopathy of a similar course and intensity to the initial symptoms. Magnetic resonance imaging (MRI) of the lumbar spine performed on the 9th day after surgery revealed a cystic formation at the site of the discectomy, suggesting a postoperative discal pseudocyst (PDP). The treatment was surgical, with a favorable outcome.



**Results:** In the literature, 36 cases of PDP have been described. The mean time to recurrence of radiculopathy was 23.3 days (range 9–38 days). In our case, the time onset of this complication was early, at 7 days.

**Conclusions:** PDP is one of the rare complications after discectomy. MRI of the lumbar spine was able to reveal this on the 9th day after discectomy. Any surgeon should think about this when faced with persistent radiculopathy after surgical treatment of a lumbar disc herniation. Its treatment can be conservative or surgical.

## Paediatric

Oral presentation

### Advantages of laser induced thermal therapy (LITT) in children suffering from refractory epilepsy using a 3T intraoperative MRI suite

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**Objectives:** Laser induced thermal therapy (LITT) has become a minimal invasive treatment option in children with medically intractable epilepsy. But the transport of anaesthetized children from the operating room to the radiological suite makes the procedure challenging.

**Background:** Thus, we analyzed our experiences using a newly built 2 room intraoperative MRI sterile operating theater for implantation and lesioning procedures.

**Methods:** During a 22 months interval we performed 11 procedures in 10 children, mean age 7.1 years (from 2 to 14 years), suffering from medically intractable epilepsy (2 harboring focal cortical dysplasia (FCD) in non-surgically amenable locations and 8 children had genetically proofed tuberous sclerosis (TS) harboring multiple tubers.

**Results:** All children had preoperative epileptological work up including invasive monitoring with depths electrodes in 10 TSC children to find out the most active tubera. In 8 procedures, 2 fibers were frameless stereotactically placed within the head frame, in 3 procedures, one laser fiber was placed into epileptological active tubers or the FCDs. The combination of stereotactic frame and head coil allowed the time saving and smooth positioning of the children into the scanner next door via a sliding operating table and a transport trolley, sparing repositioning. No complications were noted. Engel outcome was Grade Ia for both FCDs and Grade I-IV in the TSC patients.

**Conclusions:** All LITT procedures were successfully carried out without taking the children out of the head frame or the sterile rooms within a time frame of 3.5 to 5.5 hours. The intraoperative MRI suite clearly proofed advantageous for minimal invasive procedures, which normally need long transport of anaesthetized children between the operating suite and the radiological MR room.

## Trauma

ePoster presentation

### Challenges in cranial trauma surgery – cranial base fractures, a case report

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**Objectives:** Drawing clinician's attention to unusual complications in neurotraumatology; stressing the importance of concomitant diseases to healing-process.

**Background:** Unexpected course of posttraumatic and pre-existing illness can mislead clinicians, showcased on a 45 year old female patient sustaining politrauma with a lengthy recovery. Fractures of the right parietal and temporal bone, posterior cranial fossa base fracture (scattered-impressed mastoid bony fragments), subarachnoid and subdural haemorrhage, pneumocephalus, facial nerve lesion, serial rib fractures.

**Methods:**

1. Urgent surgery consisted of SDH and small bony fragments removal, filling the bone gap with bone wax. ENT suggested conservative treatment post-surgery.
2. MRI scanning confirmed no intracranial complications, but showed presence of liquid/viscous content in remaining mastoid cells. ENT surgery six months later – retroauricular approach - mastoidectomy showed abundance of bone wax and reactive adhesions which was removed, followed by tympanotomy and facial nerve decompression.
3. Repeated MRI scans still showed semiliquid content in the mastoid cells - patient was reoperated a year later - mucus, scarring, inflammatory tissue and bone wax were removed once again. MRI scans again showed collection in the mastoid cells, revision of the mastoidectomy and neurosurgical revision for possible CSL leakage were discussed, which the patient postponed.
4. Concomitant chronic inflammatory paranasal changes were also diagnosed, the patient agreed to undergo septorhinoplasty.

**Results:**

1. Following urgent surgery, the patient recovered neurologically well, otorrhagia ceased. Right sided facial palsy, hemotympanum with impaired hearing sense of ear fullness and “dripping sound” and pain remained following conservative treatment.
2. After second surgery, symptoms persisted.
3. After the third surgery, symptoms persisted.
4. Following septorhinoplasty, three years after trauma and persistent pain and symptoms, the patient experiences substantial relief.

**Conclusions:** Overlapping symptoms led us to erroneous solving of posttraumatic complications and ignoring concomitant septal deformity and chronic inflammation, while solving this problem proved successful for the patient's symptoms, although posttraumatic mastoid changes remained unsolved.

## Spine

Oral presentation

### Epidemiological trends of pyogenic spondylodiscitis in Germany: an EANS spine section study

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**Objectives:** This study aims to characterise the evolving trends of pyogenic spondylodiscitis in Germany and assess current treatment approaches.

**Background:** Pyogenic spondylodiscitis, the predominant form of primary spinal infection in the western world, presents significant diagnostic and therapeutic challenges. In Germany, comprehensive understanding of its epidemiology and inpatient management outcomes is limited, hindering the optimisation of therapeutic strategies.

**Methods:** We performed a retrospective population-based study of spondylodiscitis cases in Germany from 2005 to 2021, utilising data from the German Federal Statistical Office database. The parameters assessed were incidence trends, demographic characteristics, inpatient management strategies, and inpatient mortality.

**Results:** The study found a significant rise in the incidence of spondylodiscitis in Germany from 2005 to 2021, increasing by 112.7% from 5.3 to 11.3 cases per 100,000 individuals ( $p < 0.001$ ). This was particularly notable within the 60-79 years age group. Over the same period, inpatient mortality also surged significantly by 347% ( $p < 0.001$ ), with the highest increase recorded in the 90+ age group, observing a 2450% rise ( $p < 0.001$ ). Contrary to this trend, the mean length of inpatient stay decreased by 15% ( $p < 0.05$ ). Concurrently, there was a significant increase in surgical interventions using spinal stabilisation procedures ( $p < 0.001$ ), which might suggest a shift in the treatment paradigm for spondylodiscitis. Importantly, positive correlations were identified between surgical intervention and reduced length of stay ( $p = 0.03$ ), as well as between age and incidence rates ( $p < 0.001$ ).

**Conclusions:** The results underscore a concerning rise in spondylodiscitis incidence and mortality in Germany, affecting the ageing population in particular. A notable shift towards surgical intervention was observed. The data highlights the urgent necessity for high-level evidence studies comparing surgical versus conservative treatment, thereby guiding optimised therapeutic strategies.

## Skull Base

Oral presentation

Diamond knife dissection technique for cochlear and facial nerve preservation during resection of vestibular schwannomas (VS)

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**Objectives:** Facial and cochlear nerve preservation is a major effort, especially in large vestibular schwannomas. Bimanual dissection techniques using pincers or plate knives have been found as a crucial step for hearing preservation and avoiding facial palsy.

**Background:** We investigated a newly described technique using a diamond knife for nerve dissection during VS removal.

**Methods:** A retrospective investigation including 61 VS patients during a periode of 3.5 years was performed comparing plate-knife and diamond knife dissection during tumor removal. Altogether, 51 patients were operated using the standard plate knife technique (52yrs mean age, tumor diameter mean 20 mm) and 10 patients were operated using the diamond knife technique (46 yrs mean age, mean tumor diameter 22 mm).

**Results:** In the standard group, postoperative useful hearing preservation was achieved in 45% and permanent facial nerve palsies detected in 9.8%. On the contrary, in the diamond knife dissection group postoperative hearing preservation was found in 70% und permanent facial nerve palsies in 0% (differences highly significant). In both groups complete resection was found in 84% and 90%, small tumor residuals on the facial nerve (small postop linear MRI enhancement) found in 16% and 10%.

**Conclusions:** The newly described diamond knife dissection technique seems to have a significant better hearing outcome and facial nerve preservation rate in otherwise comparable patients during surgery of vestibular schwannomas.



## Spine

Oral presentation

Increasing incidence of spondylodiscitis in England: an analysis of the national health service (NHS) hospital episode statistics from 2012 to 2021

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**Objectives:** The Hospital Episode Statistics (HES) database contains details of all secondary care admissions across NHS hospitals in England. This study aimed to use HES data to characterise the annual activity and longitudinal change of spondylodiscitis in England.

**Background:** Spondylodiscitis is a potentially life-threatening infection of the intervertebral disk and adjacent vertebral bodies, with a mortality rate of 2–20%. Given the aging population, the increase in immunosuppression, and intravenous drug use in England, the incidence of spondylodiscitis is postulated to be increasing; however, the exact epidemiological trend in England remains unknown.

**Methods:** The HES database was interrogated for all cases of spondylodiscitis between 2012 and 2019. Data for the length of stay, waiting time, age-stratified admissions, and 'Finished Consultant Episodes' (FCEs), which correspond to a patient's hospital care under a lead clinician, were analysed.

**Results:** In total, 43135 FCEs for spondylodiscitis were identified between 2012 and 2022, of which 97.1% were adults. Overall admissions for spondylodiscitis have risen from 3 per 100,000 population in 2012/13 to 4.4 per 100,000 population in 2020/21. Similarly, FCEs have increased from 5.8 to 10.3 per 100,000 population, in 2012–2013 and 2020/21 respectively. The highest increase in admissions from 2012 to 2021 was recorded for those aged 70–74 (117% increase) and aged 75–59 (133% increase), among those of working age for those aged 60–64 years (91% increase).

**Conclusions:** Population-adjusted admissions for spondylodiscitis in England have risen by 44% between 2012 and 2021. Healthcare policymakers and providers must acknowledge the increasing burden of spondylodiscitis and make spondylodiscitis a research priority.

## Skull Base

Oral presentation

Continuous facial corticobulbar motor evoked potential monitoring during vestibular - schwannoma surgery for tailoring extent of resection and avoiding permanent facial palsy

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**Objectives:** Direct facial nerve stimulation/ mapping and A-train monitoring during vestibular schwannoma surgery (VSS) are routinely used to preserve facial nerve function. However, intraoperative prognostication of post-operative nerve function remains challenging.

**Background:** Cortico-bulbar transcranial motor evoked potentials (CoMEPs) are a relatively new monitoring modality which may deliver a more accurate estimation. A retrospective study was conducted to find out if intraoperative CoMEP amplitude reduction and threshold elevation correlates with postoperative severity and prognosis of facial palsy.

**Methods:** In total, 51 patients (median age 52yrs; 19-84) with unilateral VS (median size 20mm; 8-50) were retrospectively investigated. Intraoperative neuromonitoring consisted of auditory evoked potentials (AEPs), direct facial nerve stimulation, A-train monitoring and CoMEPs. An anodal stimulation via subdermal corkscrew electrodes on the position of C3 or C4 and a cathode near Cz with a train of 6 pulses, each with a duration of 500µs at a frequency of 500Hz and an interstimulus-interval of 2ms at 50-70 mA mean intensity was used.

**Results:** Preoperative useful hearing was present in 78% (40/51) of patients and postoperative serviceable hearing was preserved in 45% (18/40) patients, closely correlated to preservation of wave V of the AEPs. Additionally, MEPs were successfully monitored in 49/51 patient during surgery, in 2 patients technical problems occurred. In 14/51 (27.5%) patients severe facial palsies (HB 5-6) occurred postoperatively, 9 were reversible (17.6%) and 5 (9.8%) were long lasting (21 month FU). All severe palsies were predicted by a facial MEP amplitude reduction between 50-100% and more than 50% increased stimulation threshold. No false negative or false positive results were encountered.

**Conclusions:** In addition to direct facial nerve stimulation mapping and A-train monitoring, continuous intraoperative FMEP monitoring during VSS seems to be of significant value for intraoperative facial nerve preservation and prognostication of postoperative facial palsy.

## Education, Ethics, Socioeconomic

ePoster presentation

### Work life imbalance: neurosurgery's biggest challenge and biggest opportunity

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**Objectives:** To determine the rate and factors associated with WLB in neurosurgeons and NS trainees globally.

**Background:** Work life balance (WLB) is the individual's view that personal and professional activities in their life align with current life priorities. WLB is important for health and is thought to prevent burnout in the workplace. While high rates of burnout exist in Neurosurgery (NS), studies of WLB and the factors that influence WLB in NS is not known.

**Methods:** A 95-item international survey using a physician wellness framework. A WLB score was computed from a composite of 4 items and dichotomized using the mid-value of the score. Chi Squared tests were used to analyze association between WLB and age, gender, availability of mentorship, level of training, hospital/organizational characteristics and among six geographical regions of practice globally.

**Results:** Of 446 respondents (65% staff 35% trainees; median age 35-44 yrs; 28% females) only 42% indicated presence of a favorable WLB. Presence of WLB was significantly lower in: trainees compared to staff {OR: 0.45 (95% CI: 0.3 – 0.68) p = 0.0002}, those < 44 yrs,{p-value = 0.04172, OR: 1.59 (95% CI: 1.03 – 2.43)}, and those in the African region (p= 0.0005). Significant clinical workload in neurosurgery with 70% of the organizations not providing WLB integration programs was contributing to poor WLB.

**Conclusions:** Nearly two-thirds of those in NS report poor WLB with trainees, and younger individuals at particular risk. There is an urgent need for organizations globally to take leadership to implement practices to improve WLB. There is good evidence that these changes will improve medical student interest in NS, trainee and staff job satisfaction, retention and personal and organizational wellbeing.

## Spine

Oral presentation

Surgical site infection prevention following instrumented spine surgery: comparison of intraoperative wound irrigation with saline containing gentamicin and dilute povidone-iodine

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**Objectives:** This study assessed the effectiveness of normal saline containing gentamicin and diluted povidone-iodine solutions as IOWI solutions to prevent SSI following instrumented open spine surgery.

**Background:** Following open spine surgery, surgical site infection (SSI) is a frequent occurrence and is linked to considerable morbidity, especially in patients who have instrumented spine surgery. Intraoperative wound irrigation (IOWI) is an important adjunctive intraoperative measure taken to prevent SSI.

**Methods:** A prospective, randomized clinical trial was conducted. Depending on the type of IOWI solutions employed, patients undergoing instrumented open spine surgery were divided into two groups (A and B). Group A and B patients had their surgical wounds irrigated with saline containing gentamicin solution and 3.5% dilute povidone-iodine solution, respectively. Both groups were assessed and followed up for a minimum of one year for evidence of SSI.

**Results:** A total of 45 patients, divided into two groups (23 patients in group A and 22 patients in group B) completed the study. Overall, the SSI rate was 17.4% for patients in the normal saline containing gentamicin group (A) and 4.5% for those in the dilute povidone-iodine group (B), this difference was statistically significant ( $p$ -value < 0.05). The cervical spine regions have a comparable SSI rate of 4.3% and 4.5% in group A and B respectively. However, in the lumbosacral region, the SSI rate was 13% in A and 0% in B, this was statistically significant ( $p$  < 0.05). The isolated organisms in patients with SSI were staphylococcus species (50% of SSI in A and 100% in B) and pseudomonas species (25% of SSI in A and 0% in B).

**Conclusions:** Intraoperative wound irrigation with dilute povidone-iodine solution in instrumented open spine surgery is protective against SSI. It is more effective in preventing SSI compared to normal saline containing gentamicin solution as IOWI fluid in instrumented spine surgery

## Oncology

ePoster presentation

### Infiltration of plasmacytoid dendritic cells in glioblastoma tumor

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**Objectives:** Glioblastoma (GBM) is highly aggressive adult brain tumor with documented immunosuppressive tumor microenvironment (TME). New treatment targets are being explored in preclinical and clinical studies.

**Background:** Plasmacytoid dendritic cells (pDCs) are the innate immunity cells mediating prominent antiviral and antitumor immune responses. Several reports have identified tumor-infiltrating pDCs in solid tumors as negative prognostic markers and positive predictors of disease progression.

**Methods:** In this study, we determined pDC populations in peripheral blood and paired GBM tumor samples in patients (n=50) following resection and during the patient follow-up. Tumor samples were processed using enzymatic kits and gentleMACS™ Dissociator (Miltenyi Biotec Inc.) and tumor-infiltrating pDCs were analyzed by multicolor flow cytometry.

**Results:** We found large infiltration of pDCs in the majority of GBM tumor samples. Functional studies showed that freshly isolated pDCs promote proliferation of GBM primary tumor cells and also secretion of IFN $\alpha$  upon co-culture with tumor cells.

**Conclusions:** These findings suggest pro-tumor roles of plasmacytoid dendritic cells within the TME in glioblastoma that may reflect the underlying mechanisms involved in the resistance to therapy. Further research would offer new options for clinical interventions.

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## Trauma

ePoster presentation

The three-month outcome of patients operated on for chronic subdural hematoma at four hospitals, Addis Ababa, Ethiopia, 2021GC

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**Objectives:** To assess the three-month outcome of patients operated for CSDH at four hospitals in Addis Ababa, Ethiopia

To list factors associated with poor outcome.

**Background:** Chronic subdural hematomas are a relatively common condition defined as an abnormal collection of blood and its breakdown products in the subdural space, usually accompanied by a history of preceding mild head trauma. Surgical management remains the mainstay of treatment. There are very few studies in Africa and Ethiopia on the area with most being retrospective.

**Methods:** Institution-based prospective observational study was conducted among patients operated for a symptomatic chronic subdural hematoma in 4 hospitals in Addis Ababa from November 1, 2020, to June 30<sup>th</sup>, 2021 G.C.

**Results:** Out of 144 patients, 56.9% were male, the predominant symptom was headache, 75% had a trauma history and 46.5 % were 55-74 years old. On the 3-month follow-up, we had 6 deaths (4.2%); of these, only one died out of hospital. Four patients (2.8%) had GOS-E scores of 5&6 and the rest (93.1%) had good recovery with GOS-E of 7 &8. The recurrence rate of patients operated for CSDH at 3 months was very low (1.2%).

**Conclusions:** Having low admission markwalder grading, being an alcohol abuser, and having post-operative complications will impact the outcome of CSDH patients. Elevating head of patient while closing scalp might play role in decreasing recurrence.

## Oncology

ePoster presentation

A simple biopsy might be the only surgical procedure needed for an extensive skull lesion: a case report

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**Objectives:** Finding the best initial surgical procedures for a large extensive calvarial lesion.

Extending the differential diagnosis of isolated calvarial lesion to include primary calvarial lymphoma.

**Background:** Calvarial lymphoma in many aspects appear radiologically similar to meningioma, solid fibrous tumors, osteomyelitis, subdural empyema, and metastatic carcinoma. Even though it is an extremely rare phenomenon, an initial suspicion and detection of calvarial lymphoma are paramount to establish a proper diagnosis that will help dictate an appropriate management strategy.

**Methods:** An illustrative rare case of primary calvarial lymphoma was presented together with review of literature with focus on the best management strategy of this rare entity.

**Results:** A 45-year-old female initially seen by neurosurgery at our center on March-2022, she had history of forehead swelling which was progressively increasing in size over time. Metastatic workup and bone marrow biopsy were negative. Initially, we wanted to do extensive surgery for resection of the lesion, but after discussion in MDT meeting, a biopsy was taken from the lesion which revealed large B-cell lymphoma.

**Conclusions:** It is prudent to consider calvarial lymphoma in the differential diagnosis of a progressively growing skull lesion, which may obviate the need for a large resective surgery. Biopsy plus chemoradiation may be all that is required.

## Trauma

ePoster presentation

### Traumatic brain injury audit: a multicentric retrospective study from LMIC

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**Objectives:** To conduct a one year audit of all traumatic brain injuries arriving to two large tertiary care hospitals in a low and middle income country.

**Background:** Traumatic brain injury (TBI) is major cause of morbidity and mortality globally. However due to a lack of an official trauma registry, no official figures exist to document the incidence of TBI in Pakistan and nor is there official documentation of their follow up. This is therefore an attempt by the authors to construct a traumatic brain injury register in the largest city of Pakistan.

**Methods:** All traumatic brain injury patients presenting to Aga Khan University Hospital and Liaquat National Hospital (two largest tertiary care centers in Karachi) had their files reviewed retrospectively. Relevant demographic variables and clinical variables were extracted (Including but not limited to: glassgow coma scale (GCS) on arrival, need of intensive care unit admission, need of intubation, in hospital expiry and GCS on discharge along with management of patient i.e surgical versus medical).

**Results:** 215 patients arrived in emergency department of both hospital within the year 2022. 85.6% were male and 14.6% were female. 27% (i.e largest subgroup) of our patients were between the 18-30 age bracket. Most of these patients suffered from road traffic accidents. Around 20% of patients were intubated on arrival to ER and those intubated usually had a GCS of either 6/10T or 2/10T. Those who weren't intubated on arrival tended to have a GCS of 15/15. 73% of patients in our study were managed conservatively. Those who underwent surgery nearly half of whom underwent decompressive craniectomy. Only 7% of patients expired during hospital stay and majority of those who were discharged went home on a full GCS.

**Conclusions:** The data from this study only highlights the need of having an official trauma registry to guide TBI management in Pakistan.



## Oncology

ePoster presentation

A cerebellar mass that has not progressed for nine years in a patient with Lhermitte Duclos disease without PTEN mutation

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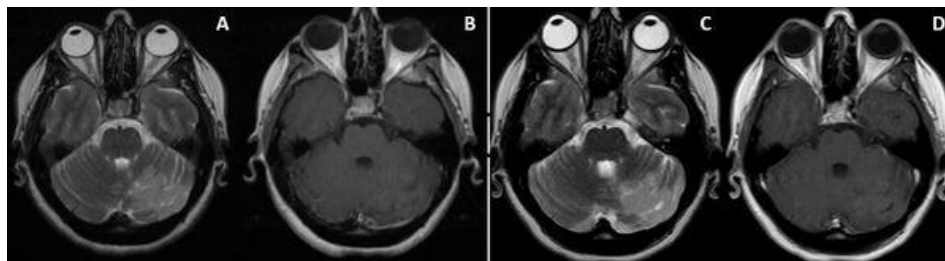
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**Objectives:** We aimed to present a case with a cerebellar mass suspected as Lhermitte-Duclos Disease (LDD), but it has not progressed in nine years.

**Background:** LDD or dysplastic gangliocytoma of the cerebellum, is a rare benign lesion characterized by replacing thickened folia and inner granular layer with abnormal ganglion cells (2). Magnetic resonance imaging (MRI) exhibits a unique tiger-stripped appearance (5,7,8). Cowden syndrome (CS) is an autosomal dominant, inherited multisystem disease. Diagnosing CS and LDD is an essential criterion. PTEN is the tumor suppressor gene, and almost all adult-onset LDD is believed to develop due to loss of PTEN function (2,5,6,10). Although surgery is recommended in symptomatic LDD, recurrence is high. Therefore, it is challenging to decide on asymptomatic cases (1,3,4,9,10).

**Methods:** A 40-year-old female applied to the outpatient clinic with occasional vertigo complaints. Her neurological examination was intact. She had a history of cholecystectomy, bilateral impingement, and intraductal papilloma of the breast. Deletions, duplications by PTEN MLPA, and mutations by DNA sequence analysis were investigated in peripheral blood to investigate whether the cerebellar mass was part of CS.

**Results:** On MRI, a 49x40x35mm mass was observed in the left cerebellar hemisphere. It was highly lobulated and had no peripheral edema, mass effect. In the cerebellar folia, the striated pattern caused by coarsening was seen (Figure 1A). Contrast enhancement was not significant (Figure 1B). Since the patient had not accepted the operation, a definitive diagnosis could not be made. However, since no PTEN gene mutation was detected, this finding facilitated our follow-up decision by suggesting that LDD is not a part of CS; therefore, the mass may not progress. Thus, no progression was observed in the nine-year follow-up (Figure 1C-D).



**Conclusions:** PTEN mutation investigation can facilitate the approach to LDD, whose diagnosis and treatment are still controversial.

## Oncology

ePoster presentation

### Meningioma with chronic uncal herniation: a missed neurosurgical emergency

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**Objectives:** Chronic uncal herniation is rarely associated with meningiomas and a new terminology not well reported in the literature. It can represent a missed neurosurgical emergency. We hereby report in details a case series of eight meningiomas with this rare finding, including presentation of the patients, MR imaging, operative challenges, surgical outcome, and analyze this phenomenon.

**Background:** The association of chronic uncal herniation with meningioma is not well-recognized. It is one of the rare presentations and it can represent a missed neurosurgical emergency.

**Methods:** Patients with histologically proven meningioma who were radiologically reported to have uncal herniation between January 2017 to December 2021 were retrospectively reviewed. The clinical and radiological data was collected from the hospital database and were analyzed.

**Results:** The study included 2 males and 6 females. The mean age of the patients was 49.7 years. Four patients were operated within 24 hours. All cases were associated with giant intracranial meningioma. Lateral sphenoid wing was the most common location. All cases had radiologically proven uncal herniation. All patients had WHO grade I meningioma and could achieve Simpson grade I except one patient who had a WHO grade III tumor and could accomplish Simpson grade III. The operative mortality was zero. Six patients were discharged with mRS 0-1 where two patients had mRS 3 and 4. Preoperative GCS and absence of neurological deficit were associated with better outcome. Delay in surgical intervention was associated with worse outcome.

**Conclusions:** The association of chronic uncal herniation with meningioma is not well-recognized. It should alert the health care provider to the urgency of the case. Subsequently, a fast referral pathway should be activated. The delay in referral and intervention in such cases can lead unpredictable deterioration and even death. A solid referral system and proper surgical timing are the main ways to avoid such delay.

## Endovascular Neurosurgery

Oral presentation

A new very-small-bore Simmons guiding sheath for transradial neurointervention: an initial experience

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**Objectives:** To increase the procedural success rate and minimize access-site complications, we developed a very-small-bore transradial triaxial system using a 3F Simmons guiding sheath (Figure)—a newly created smaller-diameter version of the 6F Simmons guiding sheath. This study evaluated the feasibility and safety of transradial neurointerventions using this system.



**Background:** Transradial access (TRA) is gaining popularity in neurointerventions because of its decreased complication rates and patient preference. Even though transradial cannulation into the left common carotid artery (CCA) can be difficult because of the lack of catheter support in the aortic arch, a transradial catheter system using a radial-specific 6F Simmons guiding sheath (outer diameter, 2.70 mm) has provided a high procedural success rate, even in challenging cases. Nevertheless, the use of large sheaths increase the risk of access-site complications which can result in TRA failure and/or serious adverse events.

**Methods:** Between March and June 2023, 6 consecutive patients who underwent 8 therapeutic neurointerventions using this system were included. The 3F Simmons guiding sheath was introduced into the target CCA via transradial sheathless approach. After a 3.2F intermediate catheter was advanced into the target carotid artery, a microcatheter was delivered into the target vessel, with parking of the 3.2F intermediate catheter as distally as possible. We retrospectively analyzed the procedural success, and periprocedural or access-site complications.

**Results:** The transradial triaxial system (2 right ICA, 2 right ECA, and 4 left ECA) and the subsequent procedure (4 tumor embolization, 2 transarterial embolization of DAVF, and 2 aneurysm coiling) were successfully achieved for all 8 cases without periprocedural or access-site complications.

**Conclusions:** The system was successfully utilized in all 8 cases without any complications. This system can represent a useful treatment option for neurointerventions and has the potential to expand the indications for TRA.

## Neurovascular Surgery

Oral presentation

Surgical neoangiogenesis in patients with Moyamoya disease: the balance between direct and indirect revascularization

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**Objectives:** The effect of surgical revascularization in patients with Moyamoya disease is based on postoperative collateral formation, however, the balance between direct and indirect revascularization is still to be determined.

**Background:** To determine the efficiency factors of neoangiogenesis of direct and indirect components of revascularization, indications and tactics for their combined use.

**Methods:** We analyzed 80 patients with Moyamoya disease who underwent 134 surgical interventions. The main group consisted of patients after combined revascularization (79 operations), 2 control groups - after indirect (19) and direct (36) operations. Post- and intraoperative MRI images were studied, the function of each of the components of revascularization was evaluated based on angiographic and perfusion modes and their contribution to the overall result of revascularization, on the basis of which various degrees of their effectiveness were distinguished.

**Results:** Statistical analysis showed that the efficiency factors of the direct components of revascularization are the larger diameter of the acceptor ( $p=0.028$ ) and donor ( $p<0.0001$ ) arteries and the imposition of double bypasses ( $p=0.009$ ). The efficiency factors of indirect synangiosis are the younger age of patients ( $p=0.009$ ), the ivy sign on MRI ( $p=0.005$ ), dilatation of the M4 branches of the middle cerebral artery ( $p=0.026$ ), the presence of transdural ( $p=0.004$ ) and leptomeningeal ( $p=0.001$ ) collaterals and the use of more indirect components ( $p=0.027$ ). The best angiographic ( $p=0.023$ ) and perfusion ( $p<0.0001$ ) results of revascularization are achieved with the combined influence of direct and indirect components. The use of intraoperative control, including the iMR perfusion study, makes it possible to identify areas of residual hypoperfusion and determine indications for additional revascularization.

**Conclusions:** Rational use of a combination of direct and indirect revascularization methods, taking into account the factors of their effectiveness and dynamic intraoperative perfusion data, allows achieving the targeted restoration of blood flow during surgical revascularization in patients with Moyamoya disease

## Neurovascular Surgery

Oral presentation

Reconstructive surgery of the extra- and intracranial brain arteries: Burdenko Center for Neurosurgery experience of 3500 vascular reconstructions

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**Objectives:** To highlight the algorithms for choosing the tactics of treating patients with cerebral ischemia caused by stenosing and occlusive pathology of the brachycephalic arteries, the features of surgical interventions and the results of this treatment.

**Background:** Treatment of acute and chronic cerebral ischemia remains an urgent problem of world healthcare. A unique opportunity of neurosurgery is the ability to perform surgical interventions at all levels of the vascular system of the brain - from the branches of the aortic arch to cortical and pial arteries for the treatment and prevention of cerebral ischemia.

**Methods:** During the last 20-years over 2500 patients with stenotic and occlusive pathology of brachiocephalic arteries were treated, who underwent over 3500 surgical interventions in Burdenko Neurosurgical Center. The surgical interventions included open reconstructive operations on the carotid and vertebral arteries, cerebral revascularization for acute and chronic ischemia, excision of neurovascular bundle tumors, compressing the carotid arteries, endovascular interventions and various variations of staged and simultaneous surgical interventions using hybrid and pseudo-hybrid approaches for patients with complex combined pathology.

**Results:** The use of a comprehensive individual approach to the examination and treatment of patients with steno-occlusive and combined pathology of the brachiocephalic arteries, taking into account clinical, angiographic and perfusion factors, made it possible to achieve good results of reconstructions in 88% of cases. Complications of surgical treatment were seen in 4.6% of cases, while persistent neurological defects developed in 2.6% of cases, and lethal outcomes - in 0.5% of cases.

**Conclusions:** Surgical treatment of steno-occlusive pathology of brachiocephalic arteries is a multifaceted interdisciplinary problem that goes beyond the standards. The conditions of the neurosurgical clinic allow the use of a comprehensive individual approach to determine surgical tactics, including a reasonable combination of both endovascular and direct methods of reconstruction and revascularization of both extracranial and intracranial arteries.

## Neurovascular Surgery

Oral presentation

Surgical versus endovascular aneurysm repair after subarachnoid hemorrhage: a single-center experience over 12 years

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**Objectives:** This study aims to review our institution's experience in managing patients with aneurysmal subarachnoid hemorrhage (SAH). Specifically, we will focus on comparing the results of surgical and endovascular approaches for aneurysm repair.

**Background:** The debate surrounding the advantages of surgical versus endovascular repair for ruptured cerebral aneurysms in SAH patients remains ongoing. At our institution, both treatment modalities are available 24/7/365, with approximately half of the patients being selected for each approach.

**Methods:** We retrieved and compared clinical, radiological, management, and outcome data from our SAH patients using the department's quality registry for SAH patients (Registration Number: 21.11433).

**Results:** This study presents the clinical and outcome data of over 1000 SAH patients treated at our department between 2011 and 2022. Both surgical and endovascular treatment modalities were utilized with similar frequency in the total cohort. We present data for mortality and functional outcome stratified by treatment modality as well as WFNS grade. We also present possible shifts in choice of treatment modality over time and corresponding trends for outcome.

**Conclusions:** Conducting an internal audit at the institutional level proves valuable in evaluating the effectiveness of surgical and endovascular approaches in the management of SAH.

## Endovascular Neurosurgery

Oral presentation

The relationship between DWI-positive area volume and ADC levels after mechanical thrombectomy in patients with low DWI ASPECTS

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**Objectives:** The aim of this study was to evaluate the factors of decreasing DWI-positive areas with a patient who had large early ischemic changes after mechanical thrombectomy (MT).

**Background:** MT for the patients with large early ischemic changes results in residual or enlarged DWI-positive areas even after effective recanalization, but sometimes results in decrease. DWI reversal volume at recanalization in patients with the large early ischemic changes was greater in patients with good outcome than in those with poor outcome.

**Methods:** This was a retrospective clinical single-center study conducted from January 2013 to December 2022. We included consecutive patients who underwent MT for acute large vessel occlusion of anterior circulation, with low pretreatment DWI-ASPECTS (0-5), effective recanalization (TICI2b or TICI3), and with MRIs taken before and after MT. We measured the volume of DWI-positive areas before and after MT. The primary endpoint was the ratio of DWI-positive area volume (after MT/before MT).

**Results:** In total, 28 patients were included. Eight patients (29%) had the ratio of DWI-positive area volume less than 1. Between the two groups with ratios less or more than 1, the median mean ADC levels of the DWI-positive area was 701 vs. 646 (P=0.02). In a multivariate logistic regression analysis, ADC levels (OR, 1.02 [95% CI, 1.01–1.04]; P=0.04) was found to be an independent predictor of the reduction in the DWI-positive area after MT. There was a negative correlation between mean ADC levels and DWI-positive area volume ratio (P<0.01, | $\rho$ |=0.65). The mean pretreatment ADC value of 649 (AUC=0.737) was the cut off value, predicting a volume ratio <1.

**Conclusions:** The mean ADC levels before MT were correlated with the volume ratio of DWI-positive areas. The mean pretreatment ADC value of 649 was the cutoff value that predicted the reduction in the DWI-positive area after MT.

## Functional

ePoster presentation

### Two cases of effective microvascular decompression for paroxysmal vertigo and tinnitus

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**Objectives:** Microvascular decompression for vertigo and tinnitus.

**Background:** We performed 3D-MRC/MRA fusion image on a patient presenting with paroxysmal vertigo and tinnitus. We have experienced two cases in which the root entry zone (REZ) of the vestibulocochlear nerve was found to be compressed by the posterior inferior cerebellar artery, and we suspected neurovascular compression syndrome (NVC) and performed microvascular decompression surgery (MVD), which resulted in relief of the symptoms.

**Methods:** 2 cases report

Case 1: 75-year-old woman. History: Sjögren's syndrome, hypertension

Two years prior to her visit, she experienced paroxysmal vertigo followed by a thunderous right tinnitus. She was treated with carbamazepine and her symptoms disappeared, but she was referred to our department for a thorough examination because of nausea. 3D-MRC/MRA fusion image was performed and compression of the right vestibulocochlear nerve REZ by the anterior inferior cerebellar artery was confirmed. Informed consent was obtained, and the patient underwent MVD. The right vestibulocochlear nerve was decompressed. Immediately after surgery, symptoms of dizziness and tinnitus disappeared, and hearing was preserved.

Case 2: 72-year-old woman. History: diabetes mellitus, postoperative uterine myoma

Three months prior to her visit, she experienced paroxysmal dizziness and tinnitus in the left ear. Her hearing was normal. Gorinosan, Melithron, and Methycobal were ineffective. He was referred to our department and 3D-MRC/MRA fusion image was performed. There was compression of the anterior inferior cerebellar artery in the left vestibulocochlear nerve REZ. Informed consent was obtained, and the patient underwent MVD. The left vestibulocochlear nerve was decompressed. Immediately after surgery, symptoms of dizziness and tinnitus disappeared, and hearing was preserved.

**Results:** Both patients had paroxysmal dizziness and tinnitus, which could be a feature of NVC.

**Conclusions:** It would be useful to consider and perform surgery by a well-trained surgeon for patients with drug-resistant, paroxysmal vertigo/tinnitus symptoms and imaging evidence of NVC.



## Neurovascular Surgery

Oral presentation

### Management of brain arterio-venous malformations: a review

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**Objectives:** To assess management strategies, drawing conclusions on the utility of each method of treatment, and delving into controversies surrounding them.

**Background:** Brain arteriovenous malformations (bAVM) are vascular malformations of the brain affecting all ages. The optimum management strategy is essentially devoid of high-quality evidence and is highly nuanced and embedded in local custom.

**Methods:** A literature search on PubMed and Medline was done on January 3rd, 2022. 11,767 articles were found, and abstracts were reviewed. Full-text review of 153 articles led to chapters from three books and 71 articles incorporated into a summative discussion.

**Results:** Spetzler-Ponce (S-P) Class A patients may be offered surgery if they are good surgical candidates and have a good number of high-quality years of life left. The exception is diffuse Spetzler-Martin (S-M) grade 2 in a patient older than 40 years: radiosurgery for unruptured and embolization for ruptured. S-P Class B may be offered surgery if a compact nidus or if younger than 40 years. If diffuse or age greater than 40, radiosurgery may be preferred if the Pollock-Flickinger score is less than 2.5. For the remainder of S-P Class B, conservative management may be preferred. S-P Class C is generally not treated unless young or those patients with poorly controlled seizures affecting their quality of life are willing to risk permanent neurological deficits.

**Conclusions:** While the quality of studies is generally high, the level of evidence is concerning with only one randomized controlled trial (RCT). Most research output hails from high-income countries, i.e., perhaps not universally applicable to all settings owing to possible genetic, environmental, and resource differences. More research is needed: large volume studies in the pregnant population, validation of scoring systems in pediatric age groups, clinical trials focused on combination multi-staged treatment modalities, and studies originating from the developing world.

## Oncology

ePoster presentation

### Supra optimal resection for glioma – the new normal

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#### Objectives:

1. To compare Gross total resection(GTR) and supra optimal resection (SOR) for frontal and temporal glioma based on progression free survival(PFS) , overall survival(OS) and karnofsky performance scale(KPS).
2. To look at morbidities associated with frontal and temporal lobectomies.

**Background:** GTR is the standard surgical treatment for glioma now. But post operative edema, residual lesion plague the patient. Supra optimal resection involving temporal lobectomy and frontal lobectomy take out the lesion along with a tumor margin. The gross cytoreduction in tumor allows for the patients with non – eloquent tumors to survive glioma.

**Methods:** During the period from 2019 to 2022, a total of 45 cases of frontal and temporal gliomas were operated. They were analyzed retrospectively. 21 of these cases have undergone lobectomies and the remaining 24 has undergone gross total resection. The cases were followed up till date. PFS, OS, KPS are measured and both wings are compared using SPSS software.

**Results:** The OS was significantly high in the SOR group (27 months vs 14.5 months). PFS was also high in the SOR group (14 months vs 8 months). The KPS remained the same in both groups when matched with pre – op KPS. The complication rates were comparable with patients who underwent lobectomy showing reduction in seizure potential.

**Conclusions:** For Non eloquent Glioma patients , temporal and frontal lobectomies offer the best chance of surviving . By applying the tenets of onco- surgery and resecting a margin, chances of recurrence decreases. There is no significant change in morbidity following lobectomies and need for anti epileptics decrease after temporal lobectomy compared to those undergoing GTR of temporal lobe glioma.

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## Oncology

ePoster presentation

### High-grade diffuse glioma surgery guided by intraoperative positron emission tomography imaging

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**Objectives:** Evaluation of intraoperative PET for resection control in adult patients with diffuse high-grade gliomas.

**Background:** It has been recently demonstrated that positron emission tomography (PET) imaging enables to outline the boundaries of the high-grade diffuse gliomas and has some advantages over MRI imaging in that point. PET potentially can be effectively used during neurosurgical intervention to monitor the removal of high-grade diffuse gliomas.

**Methods:** Six adult patients with high-grade diffuse gliomas were underwent 5-ALA-guided surgery using intraoperative neuromonitoring. The purpose of surgery in five cases was to archive the gross total resection of the metabolically active tumor volume. Biopsy of a deep-seated metabolically active focus was the goal in one case. Baseline data were obtained with 18F-FDG PET the day prior to surgery. Intraoperative 18F-FDG PET was carried out at the moment when it became necessary to confirm that the purpose of the operation was achieved.

**Results:** In all five patients who were planned for glioma resection, the metabolic active tumor on preoperative PET went beyond the contrast-enhanced zone detected by MRI. In these five cases tumor resection proceeded until the 5-ALA-induced fluorescence had been completely disappeared. However, the intraoperative PET demonstrated the remnants of 18F-FDG hypermetabolism in the resection site in 4 out of 5 observations, which served as the reason to proceed with surgery. Postoperative MRI within 24 hours demonstrated gross total removal of necrosis and contrast-enhanced tumor in all patients. In the case of a biopsy intraoperative PET confirmed that it was carried out in the planned site of diffuse glioma.

In this cohort of patients intra- and postoperative complications were not observed.

**Conclusions:** PET is feasible and promising technology in the navigation guided brain surgery for monitoring the extent of tumor removal and biopsy precision.

## Skull Base

Oral presentation

Modifications of the orbitozygomatic approaches. Topographic and morphometric study

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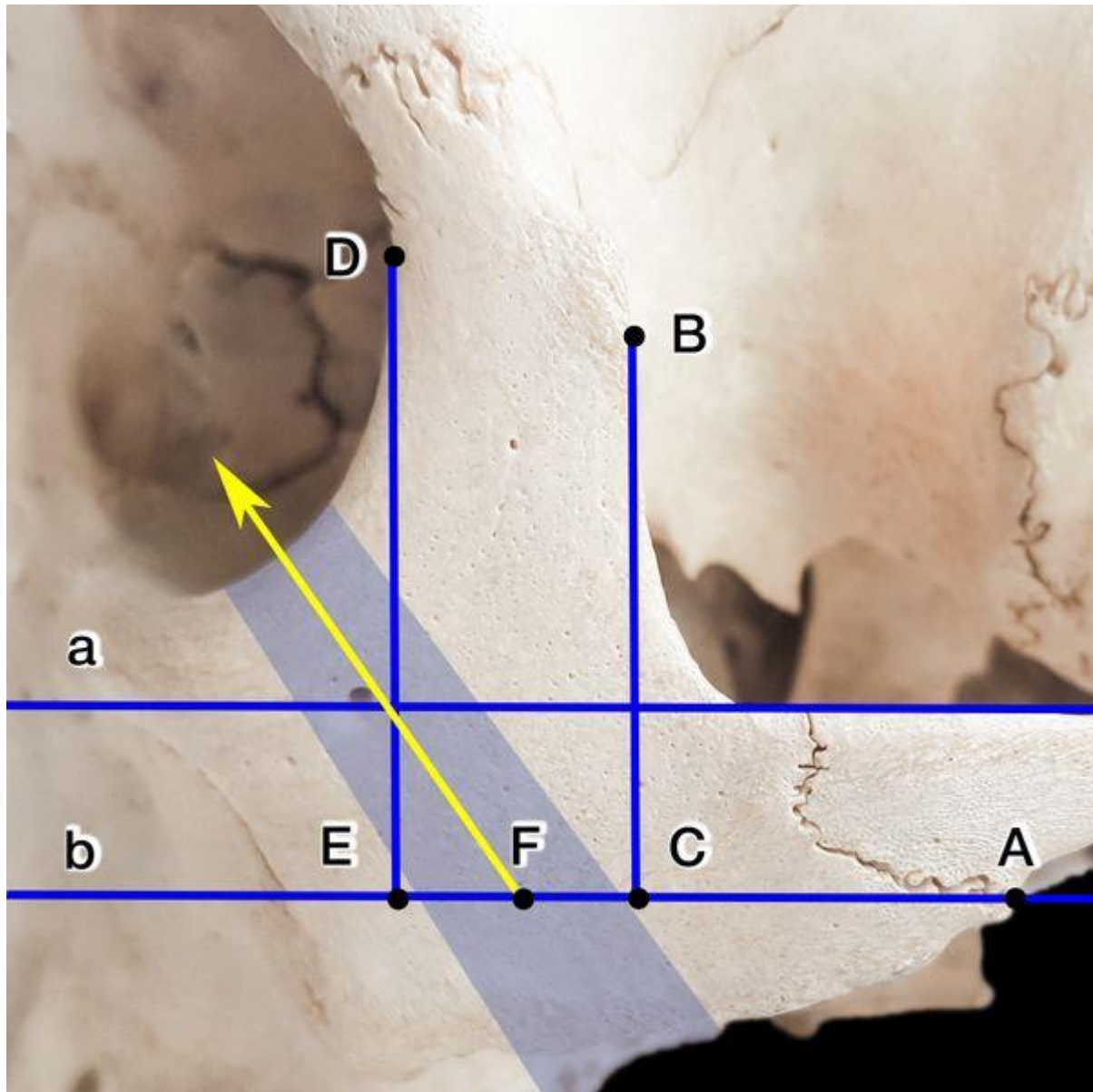
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**Objectives:** The first objective was to define the usefulness of the zygomaticofacial foramen (ZFF) and the malar eminence during orbitozygomatic approach (OZA). The second one was to compare a removal rate of the bones of the skull base during two- and three-flap OZA. Third objective was to evaluate the possibility of applying only one burr hole to perform a single-flap modified OZA. Fourth objective was to quantify the operative exposure obtained in the two-pieced OZA, modified OZA and transzygomatic approaches.

**Background:** At present, there are a number of unresolved issues in the technique of performing various variants of orbitozygomatic approaches.

**Methods:** Eighty-three adult skulls examined to evaluation of the possibility of using different landmarks. Eight sides of six cadaver heads used to compare two-and three-flap OZA, to study performing a modified OZA through one burr hole and to compare the two-pieced OZA, modified OZA and transzygomatic surgical approaches.

**Results:** The malar eminence is difficult to identify in 35% of cases. The single ZFF in 56-60% of cases and suggested point F (pic. 1) on the zygoma in 98.8-100% of cases is located into the projection of the inferior orbital fissure (IOF). The usage of three-flap OZA allows reducing a removal rate of the bones of skull base by 274 mm<sup>2</sup>. The usage of the sphenoid ridge keyhole is possible to doing only one burr-hole to perform a modified OZA. The maximum angles of attack to basilar bifurcation was greater with the OZA (vertical – 33°, horizontal – 31°).



**Conclusions:** The suggested point F is good landmark for IOF. Three-flap OZA allows to save the bones of skull base. The usage of the sphenoid ridge keyhole for modified OZA is possible. For basilar bifurcation OZA approach is preferred because it significantly increases the angles of attack.

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## Spine

Oral presentation

Clinical and radiological outcome of C1-C2 unilateral trans-articular screw fixation with modified Sonntag wiring in reducible atlantoaxial instability

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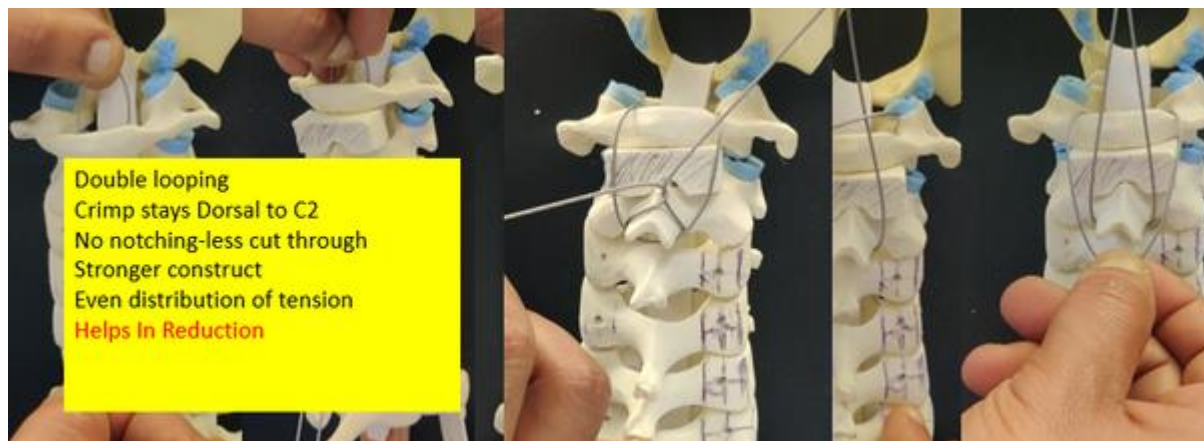
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**Objectives:** To retrospectively analyze:

1. Clinical outcome in form of MJOA, NURICK & VAS scoring as well as Functional Outcome by Odom's criteria.
2. Radiological assessment of Construct as well as fusion status by CT scan.

**Background:** Bilateral trans articular screw fixation with posterior bone graft wiring is the most effective biomechanical construct for achieving C1-C2 stability in cases of reducible AAD. However, Bilateral trans articular screw fixation is practically not amenable in all cases of AAD because of anatomical variations. In search of an evidence for an equally effective technique to overcome this practical difficulty, understanding the outcome of unilateral trans articular screw placement and adjuvant posterior wiring becomes essential.

**Methods:** Between 2014 and 2020 17 patients who underwent the procedure of interest with a minimum follow up of 1 year were included. The pre-operative radiological & clinical parameters like Atlanto Dens interval, presence or absence of basilar invagination, facet joint orientation, MJOA, NDI, VAS, Nurick grade, range of motion were compared with post-op data. Solid fusion of construct assessed by post-op CT. Type of pathology and implant failure were documented.



**Results:** Solid fusions were observed in 16 patients, while 1 patient had loss of reduction. (mean follow-up period 31 months, range 14–54 months); there was no screw breakage, wire breakage, or spinal instability. There were no operative or postoperative neurological or vascular complications.

**Conclusions:** Unilateral C1–2 Trans-articular screw fixation with modified Sonntag wiring is an excellent & safe alternative in the treatment of atlantoaxial instability when bilateral screw fixation is contraindicated.

## Oncology

ePoster presentation

### 5-ALA surgery with intraoperative balloon electronic brachytherapy for recurrent malignant gliomas

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**Objectives:** New Treatments for recurrent GBM.

**Background:** Novel approaches in glioblastoma (GBM) management are required to increase the life expectancy of patients (pts). We report interim results of recurrent GBM surgery with intraoperative balloon electronic brachytherapy (iBEB).

**Methods:** This is a preliminary report of an open-label, prospective, comparative cohort study conducted in two neurosurgical centers with ongoing follow-up. At recurrence, patients at one center (n = 26) underwent re-resection with iBEB while, at the second center (n = 15), control subjects underwent re-resection with various accepted second-line adjuvant chemoradiotherapy options. A comparative analysis of overall survival (OS) and local progression-free survival (LPFS) following re-resection was performed. Exploratory subgroup analysis based on postoperative residual contrast-enhanced volume status was also carried out.

**Results:** In the iBEB group, median LPFS after re-resection was significantly longer than in the control group (8.0 vs. 6.0 months; log rank  $\chi^2 = 4.5$ ,  $P < 0.05$ ). In addition, the median OS after second resection in the iBEB group was also significantly longer than in the control group (11.0 vs. 8.0 months; log rank  $\chi^2 = 9.2$ ,  $P < 0.01$ ). When comparing subgroups with postoperative tumor volume  $< 2.5$  cm<sup>3</sup>, OS and LPFS were also higher in the iBEB group: 23 vs. 11 and 18 vs. 8 months, respectively ( $p < 0.05$ ).

**Conclusions:** Safe radical local resection of recurrent GBM followed by iBEB prolongs life expectancy and progression-free survival in patients with GBM relapse. GLIOX trial is in progress.



## Neurovascular Surgery

Oral presentation

Cerebral aneurysms with extracranial carotid pathology: disagreements in approaches and current concepts of management

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**Objectives:** To determine the algorithm for the treatment of patients with a combination of cerebral aneurysms with carotid stenosis.

**Background:** Reconstructive interventions on the carotid arteries in patients with intracranial aneurysms requires an individual patient-selected approach, in contrast to certain standards based only on the principles of evidence-based medicine. The complexity of determining the tactics of treating such patients is due to the competition of mutually opposite pathogenetic mechanisms that determine the risk of ischemic stroke on the one hand and aneurysm rupture on the other.

**Methods:** Cerebral aneurysms were diagnosed in 4.1% of all patients who had indications for carotid endarterectomy during the last 5 years (47 patients). Variants of lesions of intracranial and extracranial arteries are presented by cerebral aneurysms of MCA (39%), ICA (26%), ACA-AComA (22%), Basilar artery (9%), VA (2%), PCA (2%), ACA (2%). Multiple aneurysms were detected in 34%. Critical stenosis of ICA (more than 85%) was seen in 93,6%, subcritical – in 6,4%. Bilateral stenoses were seen in 25,5%.

**Results:** 89 surgical interventions were performed: in all cases, carotid endarterectomy was performed on the side of stenosis. 14 patients (30%) with aneurysms were kept under follow-up. In 33 patients (70%), various surgical options for aneurysms were performed - clipping (55%), flow diversion stents (9%), occlusion of the aneurysm with microcoils (6%). There were no complications after surgical treatment. The second surgical intervention was performed 2-3 months after the first one.

**Conclusions:** The treatment of patients with a combination of steno-occlusive pathology of the main cerebral arteries and intracranial aneurysms is associated with higher perioperative risks and requires an individual differentiated approach based on a comparison of the possible risks of hemorrhage, on the one hand, and ischemic accident on the other. Depending on this, indications for surgical interventions, their sequence and the time between them were determined.



## Global Neurosurgery

Oral presentation

Leadership training in African neurosurgery: challenges and opportunities for the future

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**Objectives:** - Assess current leadership training status among neurosurgical trainees and staff  
- Barriers to taking up leadership roles and possible solutions

**Background:** The current neurosurgical practice environment has unique challenges that call for robust leadership skills for the neurosurgeon to navigate practice while leading teams at their workplace. There is a lack of literature on leadership training among neurosurgeons in Africa. We sought to determine the current state, challenges, and possible solutions.

**Methods:** A 95-item international survey designed using the physician wellness framework was sent to neurosurgical trainees and staff between June and November 2021.

**Results:** Of the 72 respondents from Africa (53% staff, 47% trainees; median age 35-44 years; 35% female) only 27% received leadership training mainly for teamwork, career progression and to enhance communication. Approximately 40% received training on leadership and managerial skills. 65% had been offered leadership positions with the majority accepting the role for career progression. Barriers to taking up leadership roles included significant clinical workload, lack of training, and organizational culture.

**Conclusions:** Improving leadership training among neurosurgeons provides a great opportunity to improve neurosurgery in Africa. Neurosurgical societies, training programs, and other stakeholders need to prioritize the creation of leaders who can enhance healthcare delivery and shape a better future to improve the health of their populations.

## Spine

Oral presentation

### Vertebroplasty - a less aggressive management alternative for aggressive vertebral hemangiomas

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**Objectives:** To share the experience in treating Aggressive vertebral Hemangioma with Angiography and Vertebroplasty and outline effective protocol.

**Background:** Vertebral hemangiomas are the most common benign lesion of spine, but majority of them are asymptomatic and are detected as an incidental finding. Approximately 1% are symptomatic and aggressive. These lesion presents as back pain in 55% and neurological findings in 45% of patients. These aggressive lesions warrant treatment, Various options like embolization, vertebrectomy, alcohol injection, vertebroplasty, laminectomy, decompression, instrumentation are available. There prevails a controversy in the ideal management of aggressive vertebral hemangiomas.

Modality	Tumour shrinkage (curative)	Shrinkage of epidural component	Neural decompression	Bleeding control	Role in non aggressive VH (symptomatic)	Role in aggressive VH without deficit	Role in aggressive VH with deficit
Spondylectomy	Maximum	Maximum	Direct	--	--	--	++
Posterior Decompression	--	--	Indirect	--	--	++	+
PMMA injection	++	+	Indirect (delayed)	++	++	++	+
Trans-arterial embolization	++	+	Indirect (delayed)	++	--	++	++
Ethanol injection	++	+	Indirect (delayed)	++	--	+	--
Primary Radiotherapy	+	+	Indirect (delayed)	--	++	+	--
Adjuvant RT	--	--	--	--	--	++	+

**Methods:** Patients admitted with aggressive vertebral hemangiomas from 2010 – 2020 were included. Data regarding demographics, symptoms, lesion site, preoperative embolization, length of the surgery, estimated blood loss (EBL) and follow-up were analyzed.

**Results:** Eleven patients were included (6 Females, Mean age: 50.72yrs with Range: 23-70). All patients presented with back pain (VAS: 4 to 8, Mean: 7) and varied neurological presentation. 7 out of 11 underwent angiography and 4 of them underwent endovascular embolization with polyvinyl alcohol particles. 9 out of 11 patients underwent, decompression & vertebroplasty as the primary surgical treatment. Two patients with posterior element involvement underwent laminectomy & excision of lesion.

Average blood loss was 350 ml and in one patient where instrumentation was done had 670ml. The average duration of follow up was 46.5 months (12-72months). Neurological improvement was noted in all patients (Nurick 0 to 2) with no worsening. No recurrence noted.

**Conclusions:** Preoperative embolization along with vertebroplasty seems to be a promising approach for aggressive hemangiomas. Digital subtraction angiography in aggressive hemangiomas helps in assessing the vascular flow, feeder vessels and the feasibility of embolization. Pre-operative embolization not only reduces the blood loss but also reduces the chances of cement embolization in such aggressive hemangiomas.

## Oncology

ePoster presentation

Prognostic implications of unplanned readmission to the intensive care unit following surgery for brain metastasis

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**Objectives:** Postoperative intensive care unit (ICU) monitoring is a common regime following neurosurgical resection of brain metastasis (BM). In comparison, unplanned secondary readmission to the ICU after initial postoperative treatment course occurs in response to unfavorable events and might significantly impact patient outcome and prognosis.

**Background:** In the present study we analyzed the prognostic impact of secondary readmission to the ICU and aimed at identifying preoperatively-collectable risk factors for the development of such unfavorable events.

**Methods:** Between 2013 and 2018, 350 patients with BM underwent BM resection at the authors' institution. Secondary ICU readmission was defined as any unplanned admission to the ICU during initial hospital stay. A multivariable logistic regression analysis was performed to identify preoperatively identifiable risk factors for unplanned ICU readmission.

**Results:** A total of 19 patients were readmitted to the ICU. Median overall survival (mOS) of patients with unplanned ICU readmission was 3 months compared to 11 months for patients without secondary ICU readmission. Multivariable analysis identified "multiple BM" (p=0.02) and "preoperative tumor-associated CRP-levels  $\geq 10$  mg/dl" (p=0.01) to be significant and independent predictors of secondary ICU admission.

**Conclusions:** Secondary ICU readmission following surgical therapy for BM is significantly related to poor OS. Furthermore, the present study identifies routinely-collectable risk factors that enable to preoperatively unmask patients that are at a high risk for unplanned ICU readmission after BM surgery.

## Trauma

Oral presentation

Site-specific suppression of complement C3 activation halts the progression of neuroinflammation after traumatic brain injury – a translational approach

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**Objectives:** Using murine model of controlled cortical impact (CCI), we studied the impact of targeted inhibition of complement activation on acute and chronic outcomes following traumatic brain injury (TBI).

**Background:** Management of TBI remains limited to supportive care and surgical decompression that do not limit the progression of neuroinflammation. The complement system is part of our innate damage recognition system that triggers the activation of neuroinflammatory pathways following TBI. We developed a fusion protein of complement receptor 2 (CR2) that binds sites of complement activation and Crry that inhibits C3 activation. The protein CR2-Crry homes specifically to sites of complement activation and inhibits local complement activity post-TBI.

**Methods:** Wild-type C57bl6 mice were subjected to CCI of moderate severity. Following impact, CR2Crry was administered as a single dose either 2 hours after or at 2 months to assess acute and chronic outcomes. Mice were then followed for 30 days studying different motor and cognitive recovery tasks to evaluate for long-term recovery. At 30-day endpoint, animals are sacrificed and brains were extracted for histological and molecular analyses.

**Results:** We demonstrate that complement activation occurs immediately after CCI and continues to propagate for at least 2 months. Complement C3b/d opsonins deposited on perilesional neurons and synapses resulting in microglial-dependent phagocytosis. Early intravenous administration of CR2Crry suppressed C3d deposition, microglial activation and subsequent neuronal/synaptic loss. This resulted in significant improvement on a battery of cognitive and motor tasks. Suppression of the terminal complement pathway alone did not lead to similar effects. In absence of intervention, there was progressive decline in cognitive performance post-CCI. However, delayed CR2Crry treatment at 2 months interrupted this decline and reversed cognitive deficits.

**Conclusions:** Injury-site targeted inhibition of complement activation allows for a translational approach to interrupt neurodegeneration in acute TBI and limit the progression of TBI to a chronic neurodegenerative disease.

## Oncology

Oral presentation

Machine learning-based tumor shape analysis as a novel tool for preoperative WHO grade estimation in surgery for intracranial meningioma

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**Objectives:** Surgical resection represents the treatment modality of choice for patients with intracranial meningioma. Magnetic resonance imaging (MRI)-based tumor texture and shape analysis might enable preoperative estimation of histopathological tumor grading.

**Background:** In the present study, we established a machine learning-based approach in order to assist clinicians in preoperatively assessing the WHO grade of meningiomas.

**Methods:** Retrospective data was collected from patients who underwent surgical removal of at least one meningioma at the authors' university hospital between January 2013 and January 2020. Each meningioma was initially annotated using a bounding box, which is a cuboid that encompasses the meningioma, in the preoperatively acquired contrast-enhanced T1-weighted MRI. A subset of these image patches (n = 238) was used as training data for the developed Convolutional Neural Network (CNN), while the remaining cases (n = 17) served as test data to validate the trained CNN.

**Results:** A total of 255 meningiomas were included in the study, comprising 191 WHO grade I meningiomas and 64 WHO grade II meningiomas based on postoperative histopathological examination. The CNN achieved a specificity of 85% and a sensitivity of 84% on the training data, and a specificity of 71% and a sensitivity of 80% on the test data.

**Conclusions:** The ongoing study's results demonstrate that the developed CNN shows promise as a method for obtaining reliable results in differentiating WHO grade I and II meningiomas using preoperatively acquired MRI images. The next step involves further optimizing the CNN, including the incorporation of clinical metadata. The developed CNN can support the diagnostic process in the preoperative assessment of the WHO grade of meningiomas, leading to an improvement in the quality of clinical care.

## Endovascular Neurosurgery

Oral presentation

Evaluation of occluded distal vessels with variable flip-angle 3-dimensional turbo spin-echo magnetic resonance imaging before acute mechanical thrombectomy

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**Objectives:** The aim of this study was to evaluate the course of occluded distal vessels before mechanical thrombectomy (MT) for acute large vessel occlusion (LVO) with noncontrast magnetic resonance imaging (MRI). The variable flip-angle three-dimensional turbo spin-echo (VRFA-3D-TSE) method was used to evaluate the course of occluded distal vessels quickly and clearly in acute LVO cases before MT.

**Background:** Intraprocedural complications occur in 1.0%-12.5% of cases. Most intraprocedural complications involve hemorrhage caused by vascular dissection and perforation. Imaging of the course of the occluded distal vessel before MT may be useful during interventional surgery.

**Methods:** Patients with acute LVO who were indicated for MT between April 2021 and March 2022 were examined by the VRFA-3D-TSE method to evaluate the distal course of occluded vessels. We included internal carotid artery (ICA) occlusion, M1 occlusion of the middle cerebral artery, and basilar artery (BA) occlusion. Preoperative images were compared to the angiographic findings after recanalization or with follow-up magnetic resonance angiography, and the results were assessed by 2 endovascular treatment specialists as excellent, good, or poor imaging.

**Results:** MT was performed in a total of 27 patients. There were 17 patients with intracranial occlusion of the ICA, M1, and BA. Occlusion was found in the intracranial ICA in 6 patients, the M1 in 7, and the BA in 4. VRFA-3D-TSE MRI was performed in all patients, and the imaging was rated (by the 2 assessors) as excellent in 12 of 17 and 14 of 17 cases, good in 5 of 17 and 3 of 17 cases, and poor in 0 of 17 cases.

**Conclusions:** In patients with acute LVO, VRFA-3DTSE MRI enabled rapid and good depiction of the course of occluded distal vessels before MT without the use of contrast medium.

## Neurovascular Surgery

ePoster presentation

Increasing frailty diminishes functional outcome in patients with non-aneurysmal subarachnoid hemorrhage: a dual specialized neurovascular center analysis

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**Objectives:** Patients with spontaneous non-aneurysmal SAH (NASAH) are known to relish a more favorable prognostic outlook compared with patients with spontaneous aneurysmal SAH.

**Background:** However, despite numerous established risk factors, the potential role of frailty on functional outcome in patients with spontaneous, non-aneurysmal subarachnoid hemorrhage (NASAH) remains elusive.

**Methods:** The study cohort was made up of all consecutive patients aged > 18 years that had been treated for NASAH at two neurovascular centers between 2012 and 2021. The modified frailty index (mFI) was used to determine patient frailty before ictus. Patients were divided into two groups: 1) non-frail (mFI 0-1) and 2) frail (mFI ≥ 2). Functional outcome was assessed 6 months after ictus by means of the modified Rankin Scale (mRS) and classified into favorable (mRS 0-2) and unfavorable (mRS 3-6). In addition, multivariate logistic regression analysis was performed in order to identify independent predictors of unfavorable outcome.

**Results:** A total of 257 patients with NASAH were identified. 56 of 257 patients with NASAH (22%) were classified as frail (mFI ≥ 2) prior to ictus. 17 of 56 patients (30%) with a mFI ≥ 2 revealed unfavorable outcome at the 6 months follow-up examination compared to 21 of 201 patients (10%) with a mFI of < 2. Besides to delayed cerebral ischemia (p<0.001) and poor-grade NASAH (Hunt & Hess grade III-IV; p=0.001) as known negative prognostic parameters, multivariable analysis identified frailty (p=0.03) as a further independent and significant risk factor for unfavorable functional outcome at 6 months after NASAH.

**Conclusions:** The present study indicates pre-ictal frailty as objectified by a mFI of ≥ 2 to constitute an independent risk factor for poor functional outcome in patients with NASAH. Further scientific endeavors might comprehensively reveal the overall impact of frailty on patient counselling and long-term prognostication in NASAH.



## Trauma

Oral presentation

Trends in traumatic brain injury in a low- and middle-income country apex trauma-care center: current challenges & plausible solutions

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**Objectives:** This study, based on extensive volume data, intend to provide an analytical-overview of the clinico-epidemiological data of head injury (HI) patients in a Low- and middle-income country (LMIC) setting, and focus on the prevailing challenges with reasonable solutions, from the perspective of developing nations.

**Background:** While the magnitude of traumatic brain injury/ head injury burden has been a significant concern in LMIC conditions, major studies addressing such an issue have been relatively less. Knowledge of specific epidemiological characteristics can guide appropriate intervention strategies, with a registry-based data adding to its value.

**Methods:** This is a registry-based observational analysis of a large-volume cohort of 14,888 patients with HI in a tertiary trauma-care-center of North-West India. An analysis of the various clinico-epidemiological parameters and risk-factors were performed in a multivariate model in relation to the severity of HI, and identify the challenges faced in LMIC scenario and discuss possible solutions.

**Results:** Notably, 50% of the patient load belonged to mild HI, despite referral (90.3%) being the predominant source. Only about one-third (30.8%) had severe HI. Less than a third reached tertiary services within an optimal time. Higher age, male gender, road traffic accidents, helmet non-usage, alcohol influence, systemic injuries and certain imaging features showed an independent association with the severity of HI.

**Conclusions:** This epidemiological study in a lower-middle income country setting brings out an important aspect of suboptimal utilization of the existing peripheral health-care systems. Strengthening and integrating these facilities with the tertiary centers in a *hub and enhanced-spoke model, task sharing and efficient back-referrals* can potentially enhance neurotrauma care, while avoiding the overburden in the apex centers. Adherence to traffic legislations is an area that needs to be focused, to reduce the HI severity.

## Skull Base

Oral presentation

### Prediction of growth after near-total resection of sporadic vestibular schwannomas: a retrospective volumetric study and review of literature

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**Objectives:** The objective of our single-center retrospective study is to determine the behaviour of residual tumor after STR/NTR and predictors of tumor recurrence.

We'll compare results with our PRISMA review of literature.

**Background:** Surgical management of vestibular schwannomas (VSs) involves a balance between intended maximal safe resection and full functional preservation. We witness increased subtotal (STR) and near-total resection (NTR) rates in patient-centered care.

**Methods:** A 3D-volumetric retrospective study was performed on clinical-radiological data of patients with sporadic vestibular schwannomas who underwent primary resection (STR or NTR) between January 2008- December 2015. Volumetry was based on pre- and postoperative contrast-enhanced T1-weighted MR imaging (CET-T1wMRI). NTR was defined as absolute residue volume <0.35cm<sup>3</sup>, relative as <5% of preoperative volume. Univariate, multivariate regression, ROC curve and Kaplan-Meier analysis were performed when appropriate.

**Results:** 93 patients underwent STR or NTR via translabyrinthine approach, among them 76 patients (82%) had NTR. 53 patients (70%) from NTR-group had "not identifiable" residue on the postoperative CET-T1wMRIs.

Median volume of "visible" NTR residues was 0.112cm<sup>3</sup> (range 0.028-0.317cm<sup>3</sup>), versus 0.98cm<sup>3</sup> in STR-group. The residue regrowth was observed in 1.3% of patients in NTR-group and in 41% in STR-group. Median follow-up (FU) time of 7.2 years (range 4.8-13.8 yrs).

Kaplan-Meier plot progression-free survival rates at 5 and 10 years were 98%, 98% in NTR-group versus 70%, 45% in STR-group, respectively ( $p < 0.0001$ ,  $HR = 66.8$ ). The median relative growth rate was 39%/year (range 5-331). The significant predictors of recurrence were: STR, larger residue with cut-off volume ">0.2cm<sup>3</sup>" from ROC curve analysis ( $p < 0.0001$ ).

Facial function at 1 year FU was: HB1 (71% patients), HB2 (18.3%), HB3-4 (5.4%), and HB5-6 (4.3%). Importantly, all facial palsies occurred only in the NTR-group, none in STR-group ( $p = 0.025$ ). Adjuvant radiosurgery was recommended in 41% of STR residues, none in NTR-group.

**Conclusions:** These results support our long-term strategy favoring NTR over STR in sporadic vestibular, if possible. NTR offers both excellent functional preservation and longitudinal tumour control close to the GTR outcome.

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## Spine

Oral presentation

### An anti-inflammatory and neuroprotective biomimetic nanoplatform for repairing spinal cord injury

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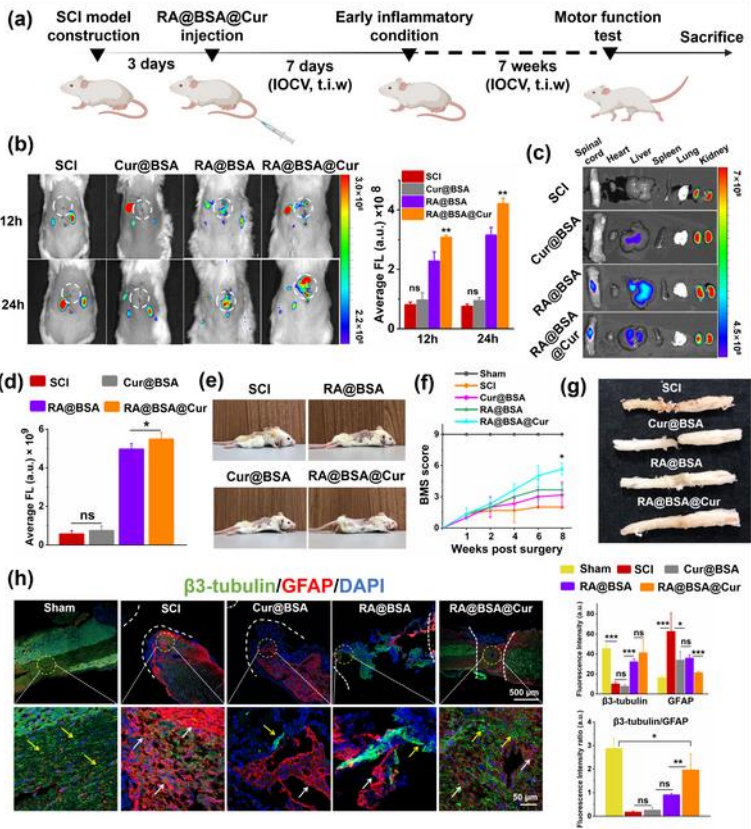
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**Objectives:** To determine the neuroprotective effects of Bull Serum Albumin nanoparticle by inhibiting inflammation during SCI repair.

**Background:** Spinal cord regeneration after a spinal cord injury (SCI) remains a difficult challenge due to the complicated inflammatory microenvironment and neuronal damage at the injury sites.

**Methods:** The retinoic acid (RA) and curcumin (Cur) were co-loaded with bovine serum albumin (BSA) self-assembly to obtain RA@BSA@Cur nanoparticles (NPs) for SCI. We examined the treatment of RA@BSA@Cur NPs in nerve cells and the injured spinal cords of C57BL/6 female mice respectively, following histological, behavioral, microscopic, immunofluorescence, and western blotting analyses.

**Results:** The constructed RA@BSA@Cur NPs not only induced polarization of macrophages toward pro-regenerative phenotypes and markedly reduced the inflammatory response of macrophages or microglia, but also increased neurite length in PC12 cells and neuronal differentiation of bone marrow mesenchymal stem cells, improved the differentiation of neural stem cells (NSCs) into  $\beta$ 3-tubulin+ neurons, and reversed the pro-astrocyte differentiation effect of inflammatory cytokines on NSCs. In vivo experiments revealed that RA@BSA@Cur NPs regulated the phenotypic polarization of macrophages, inhibited the release of inflammatory mediators, promoted functional neuron regeneration and motor function, and further inhibited scar tissue formation.



**Conclusions:** The BSA-based biomimetic nanomaterials could be used as ROS scavengers and nerve regeneration promoters for treating SCI.

## Oncology

ePoster presentation

Posterior fossa space occupying lesions – a six-year experience from a tertiary care setting of a resource-limited country

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**Objectives:** To evaluate the clinical manifestations, histopathological spectrum and surgical outcome of posterior fossa (PF) space occupying lesions.

**Background:** Posterior fossa (PF) is one of the most common sites of malignancy in both adults and children. In children, the PF is home to more than half of all brain cancers, whereas, in adults, it account for 15–20% of malignancies. Despite advances in micro-neurosurgery procedures, PF tumor surgery is still associated with high rates of death in our region of the world, particularly among children.

**Methods:** This retrospective, cross-sectional study was conducted at the Department of Neurosurgery, Unit-III, Punjab Institute of Neurosciences, Lahore, Pakistan from 2017 to 2022, involving 96 patients, irrespective of their age, who underwent excision of space occupying lesions in PF. Data was collected for demographics, clinical presentation, surgical findings, histopathology and post-procedural sequelae onto a questionnaire generated via Google Forms from the records of patients.

**Results:** Males comprised 51.04% of the studied patients. The mean age at presentation was  $16.30 \pm 7.23$  years. Headache and vomiting were the common clinical manifestations in 87.5% and 72.91% patients, respectively. Gross total resection was achievable in 89.58% patients, with the remaining undergoing subtotal resection. Medulloblastoma was the most frequently seen pathology in 30.20%, followed by ependymomas in 26.04% and pilocytic astrocytomas in 22.91% patients. Cerebrospinal fluid leak was noted in 7.29% cases.

**Conclusions:** The best results were seen in pilocytic astrocytoma surgery, followed by ependymoma surgery, whereas the worst results were seen in medulloblastoma surgery. The surgical treatment of posterior fossa tumors still poses a significant challenge to neurosurgeons. Our experience shows that accepted results, complications, and surgical outcomes can be obtained by meticulous surgical techniques from previous clinical studies.

## Oncology

ePoster presentation

### Rare ectopic presentation of an intrasphenoidal rathke's cleft cyst

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**Objectives:** The objectives of this unique case report is to illustrate the radiological findings of a rathkes cleft cyst (RCC) in the sphenoid sinus and to provide a series of endoscopic images depicting the endoscopic appearance of an intrasphenoidal RCC and outline the resection technique.

**Background:** We report the seventh case in all the literature and the first to depict a series of endoscopic pictures.

**Methods:** This case report was compiled with the patients consent obtained for data compilation and publishing.

**Results:** Based on the reported cases, there appears to be an almost equal gender distribution and variable presentation age with early and later-life presentations. Interestingly, all the studies that report size for the RCC, report a size of 4cm on clinical presentation. Four centimeters is possibly the threshold that an intrasphenoidal lesion can grow to, before it starts compressing neighboring anatomy and lead to compressive symptoms and presentation. All cases presented with headaches, while presenting ocular signs were variable, with some patients having no visual symptoms and others suffering from diplopia and visual acuity loss. Endoscopic surgical approach was used in all cases reported with some centres opting to fenestrate the lesion and other centres to resect the lesion, both yielding positive results post operatively.

**Conclusions:** Although exceptionally rare, when encountering a cystic lesion within the sphenoid sinus, RCC should form part of the differential. Management of this condition can be achieved with the use of either endonasal endoscopic fenestration or resection.

## Oncology

ePoster presentation

Epidemiological, clinical, and surgical profile of patients with meningioma in a neurosurgery referral center in northeastern Brazil

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**Objectives:** Analyze the epidemiological, clinical, and surgical profiles on intracranial meningioma patients.

**Background:** Meningiomas are the most common benign primary tumors in the central nervous system. Although they are not malignant, they can lead to high rates of disability and mortality in patients affected by this disease.

**Methods:** This is a retrospective longitudinal study conducted between February 2018 and January 2022, on a neurosurgical reference center. Epidemiological, clinical, and imaging factors were analyzed.

**Results:** A total of 89 patients were included in the study. The majority of patients were women (79%), with an average age of 54.38 years ( $\pm 12.03$ ). Comorbidities observed among patients included systemic arterial hypertension in 39.33%, diabetes mellitus in 13.48%, dyslipidemia in 3.37%, hypothyroidism in 3.37%, smoking in 11.24%, and alcoholism in 6.7%. Meningiomas exhibited a well-distributed laterality (right: 35.57%, left: 44.45%, bilateral: 20.98%). The distribution was as follows: Convexity 52.39%, sphenoid wing 14.03%, olfactory groove 10.50%, sellar tubercle 10.50%, falx 10.50%, parasagittal 5.24%, petroclival 3.51%, clivus 1.76%, and tentorium 1.76%. Histologically, 48.31% were grade 1 meningothelial, 14.61% were grade 2 atypical, and 12% were transitional type 1, while the remaining subtypes were less common in the sample. Surgical approach was implemented in 85.4% of cases. Furthermore, an analytical evaluation revealed a moderate positive correlation between tumor edema and age (Spearman 0.41, with p-value 0.001).

**Conclusions:** Our sample is consistent with the patterns observed in the literature, with higher prevalence in women, between ages of 42 and 66. The most common comorbidities found were systemic arterial hypertension and diabetes mellitus, which aligns with the typical comorbidities in this age range. Lateralization predominantly occurred on the right side, with little variation compared to the left. Almost all patients underwent surgical intervention, reflecting that patients referred from outpatient clinics already had a surgical indication, with small proportion requiring conservative management for various reasons.

## Spine

Oral presentation

### Conservative management of fibrous non-union of type II odontoid fractures – a multi-institutional study

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**Objectives:** The aim of the present study was to evaluate the safety of conservative management of patients with fibrous non-union of type II odontoid fractures at three centers in New England.

**Background:** Odontoid fractures are common in older people and have a low rate of osseous union following conservative management. Although indications for surgical stabilization are strong in patients with radiologically unstable fractures, no clear consensus exists for the management of non-unions that are radiologically stable after collar removal, or so-called “fibrous non-unions.”

**Methods:** Electronic medical records at three institutions in New England were searched from 2005-2022 for patients sustaining type II odontoid fractures managed with a collar, orthosis, or halo vest within 12 weeks of presentation. Follow-up imaging was studied to determine presence of fibrous non-union, defined as non-union without abnormal motion on dynamic imaging, or, in the absence of dynamic imaging, safe collar removal as determined by the clinician.

**Results:** A total 866 patients with type II odontoid fractures presented to the three institutions. Of these, 26.8% (232 patients) underwent immediate surgical stabilization and 20.3% (176 patients) were lost to follow-up. Of the remaining 458 conservatively treated patients, 22.5% (103 patients) demonstrated osseous-union, 15.9% (73 patients) unstable non-union, 53.3% fibrous non-union (244 patients) and 8.3% (38 patients) died during the follow-up period, all due to causes unrelated to spinal disease. The mean age of the 244 patients with fibrous non-union was 80.3 years and the mean follow-up 7 months. During follow-up, no patient with fibrous non-union developed neurological events or died as a consequence of their fracture.

**Conclusions:** This work adds to a growing body of literature supporting the safety of conservative care in carefully selected patients with fibrous non-union of type II odontoid fractures. To the best knowledge of the authors, this is the largest such cohort.



## Paediatric

Oral presentation

### Medulloblastoma and gene copy number variation: HDAC and PI3K inhibitors as potential therapeutic options

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**Objectives:** The objective of this study is to determine the genomic alterations of SHH-MB tumors and assess the potential involvement of HDAC and PI3K inhibitors as therapeutic options.

**Background:** Medulloblastoma (MB) is the most common malignant brain tumor in children. Copy number variation (CNV) refers to a form of genomic structural variation that results in abnormal gene copy numbers, including gene amplification, gain, loss, and deletion, and is an important factor in regulating the expression of both protein-coding and non-coding genes, affecting various signaling pathways. Sonic hedgehog (SHH) MBs originate from granule cell precursors of the developing cerebellum that display SHH-signaling pathway activation. Aberrant p53 in SHH-MB is linked to disease progression and poor prognosis.

**Methods:** SHH-MB tumors (n=15) were evaluated for genomic abnormalities using OncoScan CNV Plus-Assay and ChAS 4.2 software. The presence of isochromosome 17q (i(17q)) was determined by FISH. Effects of small molecule inhibitors, targeting HDAC (LBH-589), PI3K signaling (Buparlisib), and a combined HDAC/PI3K inhibitor (CUDC-907) were assessed via functional assays (cell proliferation, migration, cell cycle, and drug resistance).

**Results:** About 30% of patients exhibited i(17q) and the presence of multiple p53 mutations with no apparent correlation with metastasis. Besides p53, frequent genetic aberrations in IDH2: p.R140Q:c.419G>A (40%); PTEN:p.P248fs\*5:c.741\_742insA (60%); KRAS:p.Q61H:c.183A>C (60%) were observed. LBH-589, BKM-120, and CUDC-907 inhibited SHH-MB cell proliferation and migration, and drug resistance studies demonstrated resistance to BKM-120. These inhibitors function by targeting the mTOR pathway.

**Conclusions:** While a significant number of SHH-MB samples displayed i(17q) and mutant p53, their association with disease progression remains elusive. The presence of i(17q) may define a poor prognosis, and aberrant p53 may be an essential criterion for defining the metastatic potential of SHH-MB. Furthermore, small molecule PI3K, HDAC inhibitors could provide novel therapeutic options for SHH-MB treatment.

## Skull Base

ePoster presentation

### Sphenopalatine artery pseudoaneurysm after endoscopic pituitary surgery: a case report

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**Objectives:** Report a case of postoperative Sphenopalatine artery pseudoaneurysm as a complication of endoscopic pituitary adenoma removal.

**Background:** Epistaxis after endoscopic pituitary surgery can usually be controlled with conservative measures such as topical cautery, hemostatic agents, and nasal packing. However, severe epistaxis due to transaction or injury to major arterial structures may occur. Sphenopalatine artery (SPA) pseudoaneurysm as a cause of severe postoperative bleeding is very rare and has seldom been reported in the literature.

**Methods:** A retrospective analysis of a patient's the clinical record was undertaken. Evidence research was conducted using PubMed®.

**Results:** A 68-year-old man presented a clinical history of progressive headache and bitemporal hemianopsia which eventually led to left eye blindness. Magnetic resonance imaging (MRI) revealed a pituitary macroadenoma (35x25x24 mm) that extended up and out of the sella turcica. Endoscopic trans-nasal trans-sphenoidal (ETT) pituitary adenoma resection was performed, but complete removal of the suprasellar component was adjourned due to both tumor consistency and a severe nasal bleeding that occurred, but easily arrested with anterior nasal packing only. Nasal packing was removed 6 days after surgery without any obvious hemorrhage. One month after surgery the patient was admitted with a delayed massive nasal bleeding, with need of 2U of erythrocyte suspension transfusion, which prompted angiographic investigation. A pseudoaneurysm of the sphenopalatine artery (5x3 mm) was detected and successfully treated with microcatheter embolization, with no further complications.

**Conclusions:** Even though SPA pseudoaneurysm is an extremely rare complication of ETT pituitary adenoma surgery, this case highlights the importance of considering major vessel abnormalities when dealing with major epistaxis after surgery.

## Functional

ePoster presentation

### Image-guided LINAC radiosurgery for trigeminal neuralgia

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**Objectives:** Frameless image-guided robotic radiosurgery delivering 60 Gy to a 6mm mid-cisternal/retrogasserian segment of the affected trigeminal nerve was used to treat 753 patients affected by severe Trigeminal Neuralgia(TN) refractory to medications . Long-term clinical outcomes after 5 and 10 years are here reported.

**Background:** Frameless radiosurgery for TN was introduced at Stanford University in 2002. The senior author refined this technique over the years and introduced a TN frameless radiosurgery protocol at the Cyberknife Center of CDI( Milano,Italy).This protocol aims to deliver an homogeneous radiation dose to an extended segment of the trigeminal nerve( 6 mm) without hot spots. The long term results of this novel and completely noninvasive treatment modality for TN are here reported.

**Methods:** 753 patients with severe, long-standing TN refractory to medications have been treated at the Cyberknife Center of CDI,Milan,Italy over the last 13 years. A dedicated protocol for imaging ( head CT with and without contrast, slice thickness 0,5 mm; brain MR including MPRAGE and CISS/FIESTA sequences) and treatment( selecting a 6 mm segment of the nerve going from the midcisternal toward the retrogasserian region with a dose prescription of 60Gy @80% isodose) was employed. Regular clinical follow-up was performed one or more times per year according to clinical needs and distance from the treatment. Recurrent pain was treated with the same protocol delivering a lower dose of 45 Gy.

**Results:** Pain control rates of 92%,87%,76% ,74% after respectively 1,2, 3 and 5 years have been found. 105 patients with follow-up of 10 years show pain control rate of 72% while the rate of bothering paresthesias was 5% (5 patients). No other neurological complications were found at this time.

**Conclusions:** Long-term follow-up shows that frameless Linac radiosurgery provides long-term pain control in over 2/3 of the treated patients, with low rate of sensory complications and no other neurological complications.

## Spine

Oral presentation

Conservative versus early surgical treatment in the management of pyogenic spondylodiscitis: a systematic review and meta-analysis

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### Objectives:

The primary objective was to compare the mortality, relapse rate and length of hospital stay of conservative versus early surgical treatment of pyogenic spondylodiscitis, including determinants of outcomes.

### Background:

Spondylodiscitis is the commonest spine infection, and pyogenic spondylodiscitis the most common subtype. Whilst antibiotic therapy is the mainstay of treatment, some advocate that early surgery can support infection clearance, improve survival and prevent long-term consequences such as deformity. Others view early surgery as unnecessarily risky. Given the condition carries a high mortality rate of up to 20%, the most effective treatment must be identified.

### Methods:

The PROSPERO registration number is CRD42022312573. MEDLINE, Embase, Scopus, PubMed and JSTOR were searched for original studies comparing conservative versus early surgical treatment of pyogenic spondylodiscitis. Included studies were assessed using the ROBINS-1 tool, and eligible studies were evaluated using meta-analyses, influence and regression analyses.

### Results:

Thirty-one studies were included in the systematic review. The meta-analysis, with an overall pooled sample size of 10,954 patients from 21 studies, found that the pooled mortality among patients treated with early surgery was 8% versus 13% for patients treated conservatively. The mean proportion of relapse/failure among patients treated with early surgery was 15% versus 21% for patients treated conservatively. Further, it concluded that early surgical treatment, when compared to conservative management, is associated with a 40% and 39% risk reduction in relapse/failure rate and mortality rate, respectively, and a 7.75 days per patient reduction in length of hospital stay ( $p < 0.01$ ). The most highly significant predictors of treatment outcome were found to be IVDU, diabetes, presence of epidural abscess, positive cultures, location of infection and age ( $p < 0.001$ ).

### Conclusions:

Overall, early surgical management was always significantly more effective in terms of relapse/failure and mortality than conservative management in the treatment of pyogenic spondylodiscitis.

## Spine

ePoster presentation

### Atlantoaxial fixation for type II odontoid fractures

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**Objectives:** Type II odontoid fracture need surgical stabilization for disabling neck pain and instability. Anterior odontoid screw fixation is a well- known technique. However, certain patients require posterior fixation. We present our surgical results experiences with twelve cases managed by the posterior C1-C2 fixation.

**Background:** The indication for posterior stabilization in type II odontoid fracture is disabling neck pain and instability. We present our surgical results experiences with twelve cases managed by the posterior C1-C2 fixation.

**Methods:** This is a retrospective review of twelve patients operated on between January 2019 and December 2022 for Type II odontoid fractures with posterior fixation technique. Their clinical profile was collected from case files. The radiological data retrieved from radiological archives. The indication for surgery were instability and refractory neck pain. The surgical decision for posterior fixation was guided by fracture morphology.

**Results:** The mean age of presentation was 41.22+/- 9.85 years. Nine patients had Type II, and three had Type IIa odontoid fracture. All patients presented with unbearable neck pain. Two patient had a quadriplegia. The fracture line was anterior- inferior sloping is seven, posterior-inferior sloping in three, and transverse in two case. The anterior-inferior displacement of fracture ranged from 0 to 7 mm (mean 2.44+/- 2.18 mm). Partial transverse ligament tear without the Atlanto-Axial Dislocation was present in four patients. The C1-C2 joint distraction was required in eight cases. C1-C2 joint spacer was required in four cases. Following surgery neck pain was relieved in all cases. Complete fracture alignment was achieved in eleven patients. There were no postoperative complications. All the mean follow-up of 18.22+/-8.61 months, there was no implant failure.

**Conclusions:** Posterior C1-C2 fixation is an excellent alternative to anterior fixation in selected cases.

## Skull Base

Oral presentation

Incidence of postoperative cerebrospinal fluid leaks in endoscopic endonasal transsphenoidal surgery for pituitary adenomas without sellar floor reconstruction

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**Objectives:** To determine the incidence of postoperative cerebrospinal fluid (CSF) leaks after endoscopic endonasal transsphenoidal surgery (EETS) for pituitary adenomas without sellar floor reconstruction (SFR).

**Background:** In patients without iocSF leak, EETS without SFR may be the preferred method to achieve less invasiveness, cost-effectiveness, short hospital stays, and fewer complications. There is paucity of research on the incidence of poCSF leaks following endoscopic endonasal transsphenoidal surgery (EETS) for pituitary adenomas without SFR and this served as the basis for our study.

**Methods:** This retrospective observational study was conducted at Department of Neurosurgery Unit-III, Punjab Institute of Neurosciences (PINS), Lahore, Pakistan from January, 2018 to December, 2022. It is a non-probability based consecutive case series. A total of 316 patients meeting the inclusion criteria were chosen only.

**Results:** Among the 316 patients, 102 (32.3%) were male, while 214 (67.7%) were female. Mean age was  $40.98 \pm 7.8$  SD (range 23 to 65 years). Regarding size of pituitary adenomas, 19 (6%) were microadenomas and 297 (94%) were macroadenomas. Overall postoperative CSF (poCSF) leak in our patients was 2.8%. Among cases with poCSF leak, 4 (3.9%) were male and 5 were female (2.3%) with the P-value of 0.477. Regarding size of pituitary adenomas, only 1 (5.3%) microadenoma had poCSF leak whereas 8 (2.7%) macroadenomas had poCSF leak with the P-value of 0.432.

**Conclusions:** Pituitary adenomas can be successfully treated with EETS without SFR in patients who do not experience intraoperative CSF leak.

## Oncology

Oral presentation

Methodological and ethical challenges in the use of focused ultrasound for blood-brain barrier disruption in neuro-oncology

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**Objectives:** This study aims to evaluate the adherence of FUS for BBB disruption in neuro-oncology to the IDEAL-D framework and to assess the risk of bias using the SYRACLE and ROBINS-I tools.

**Background:** Focused ultrasound (FUS) shows promise for enhancing drug delivery to the brain by temporarily opening the blood-brain barrier (BBB), particularly for gliomas. The IDEAL-D framework for the introduction of surgical innovations and the SYRACLE and ROBINS-I tools for assessing risk of bias in animal studies and non-randomized trials, respectively, provide a comprehensive evaluation of methodological quality and safety.

**Methods:** A comprehensive literature review on FUS in neuro-oncology was conducted, and the included studies were evaluated using the IDEAL-D framework, SYRACLE, and ROBINS-I tools.

**Results:** A total of 19 published studies and 12 registered trials focusing on glioma, were identified. FUS demonstrated successful BBB disruption, increased drug delivery, improved survival rates, and good safety. However, IDEAL-D analysis showed inadequate investigation or reporting of neurological side effects, randomization, blinding, or ethical considerations in most animal studies. Of the 16 pre-clinical Stage 0 studies, six had formal approval from an animal committee, five followed appropriate animal care policies, and four had no information on approval or animal care. Neither animal nor human studies reached the IDEAL-D stage endpoint. The SYRACLE analysis revealed a high risk of bias in animal studies, while the ROBINS-I analysis found most human studies had a high risk of bias due to a lack of blinding and heterogeneous medication and patient characteristics.

**Conclusions:** The development of FUS for neuro-oncology must adhere to more rigorous safety standards. The complementary use of IDEAL-D, SYRACLE and ROBINS-I tools indicates a high risk of bias and ethical limitations in both animal and human studies, highlighting the need for further improvements in study design to ensure the safe and effective implementation of FUS in neuro-oncology.

## Education, Ethics, Socioeconomic

Oral presentation

### Self citations in neurosurgery: unethical or misunderstood

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**Objectives:** The role of self-citation has not been discussed in the neurosurgery literature, although citations, citation indices, and impact of research may enhance funding opportunities, academic positions, fellowship opportunities, employment, and professional identity development.

**Background:** We sought to assess the magnitude and role of self-citation in academic neurosurgery by analyzing the patterns or self citations in the top academic journals of neurosurgery. We also sought to understand the need and rates of self citations of young and established academic neurosurgeons.

**Methods:** We performed a retrospective analysis of the citation and self-citation rates of articles published in 2001-2020 in 7 major neurosurgery journals: Acta Neurochirurgica; Journal of Neurosurgery, Journal of Neurosurgery: Pediatrics; Journal of Neurosurgery: Spine; Neurosurgery, Neurosurgical Review, and World Neurosurgery.

**Results:** The total number of citations was highest for Journal of Neurosurgery and lowest for Neurosurgical Review. Journal of Neurosurgery: Spine had the highest average number of citations per article, followed closely by Journal of Neurosurgery. The self-citation rate increased for all journals over the time period 2001 to 2020. The highest number of self-citations per article during 2016-2020 was seen in Journal of Neurosurgery: Pediatrics and World Neurosurgery. Neurosurgical Review had the lowest number of self-citations per article. Established neurosurgeons had lesser self citation rates when compared to younger ones. However, self citation rates in neurosurgery are much lower when compared to other branches of medicine. Certain niche sub-specialties like radiosurgery have a higher self-citation rate.

**Conclusions:** Academic neurosurgeons must understand the ecosystem around self-citation. In our study, we found overall low levels of self citations in neurosurgery journals with a few outliers. We have, however, noticed an increasing trend in self-citations rates. Self-citation rates should be considered while evaluating the impact of an author and research productivity. Against popular belief, self-citation is not always unethical and must be understood within its circumstances.



## Neurovascular Surgery

Oral presentation

Giant and very large intracerebral aneurysms: various options of cerebral bypasses and the patient outcomes - an institutional experience

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### Objectives:

- To enumerate various bypass options for treatment of giant and very large intracerebral aneurysms
- Study the outcomes of bypass and also patient related outcomes.

**Background:** Intracerebral aneurysms can be categorized as very large (size- 16-25 mm) and Giant (size > 25 mm). in this era of multimodality treatment of intracerebral aneurysms especially endovascular treatment it is equally important to study the role of Bypass surgeries for these aneurysms. Considering the challenge these set of aneurysms pose, Various bypass techniques can provide the therapeutic answers posed by them.

**Methods:** This is a retrospective study from 2019 to 2023. All cases of Very large and Giant aneurysms were compiled. Bypass techniques and the postoperative results were collected. Patient related outcomes were also studied.

**Results:** A total of 11 patients were included in the study. 8/11 (73%) patients were female where as 3/11 (27%) were male. All patients had aneurysms in the anterior circulation. 3/11 patients had very large aneurysms and 8/11 patients had giant aneurysms. Various types of Bypass were used- 2/11 (18%) patients underwent internal maxillary-intracranial bypass, 3/11 (27%) underwent high flow bypass and 6/11 (55%) underwent low flow bypass. 10/11 (91%) patients had patency of bypass on follow up. Mean follow up duration was 27.6 months. 1/11 patient had mRS of 3 whereas 10/11 patients had mRS of 0-2.

**Conclusions:** Cerebral bypass as a treatment modality for Very large and giant aneurysms provides an excellent variety of options. It can be performed safely and is cost effective in nature. They also are able to provide good patient related outcomes and aneurysm occlusion rates. Hence careful consideration should be given to the various bypass techniques for the treatment of these select aneurysm.

## Epilepsy

Oral presentation

A retrospective non-randomized investigation into potential technical and clinical benefits of intraoperative ultrasound during epilepsy surgery for focal cortical dysplasia

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**Objectives:** In this study we aim to compare the use of intraoperative ultrasound(iUS) to other forms of intraoperative neuro-navigation during epilepsy surgery secondary to drug intractable Focal cortical dysplasia. We also outlay the benefits and technical challenges of using iUS Intraoperatively.

**Background:** The paramount predictor in achieving optimum post-surgical seizure outcome following epilepsy surgery is safe gross total resection (GTA) of the offending lesion. Considering that dysplastic brain tissue is characteristically indistinguishable from normal cortex, attaining safe GTA is usually a daunting task.

**Methods:** We employed a retrospective study design of 50 epilepsy surgery cases conducted at our center with application of intraoperative ultrasound navigation. They were compared to 52 epilepsy surgery controls published in literature whose surgery had used other forms of intraoperative navigation (intraoperative MRI). The key characteristics compared were Engel epilepsy surgery outcome scale (the outcome of interest), ultrasound application (the primary exposure), gender, type of focal cortical dysplasia, seizure frequency and age. Descriptive statistics were generated on both study groups with regard to the key study variables. Inferential statistics technique employed was ordered logistic regression which assumed complete case analysis because it was observed that all missing data was in the control (non-ultrasound) group and the mechanism behind the missing data was unlikely to be random.

**Results:** 80% and 82.7% of the ultrasound and non-ultrasound groups, respectively, were classified as Engel class I. Results of univariable and multivariable statistical analysis failed to demonstrate statistically significant difference in post-operative outcome in two study groups.

**Conclusions:** Intraoperative ultrasound is a safe, inexpensive and effective tool to achieve real time intraoperative FCD imaging during epilepsy surgery. The study also demonstrated that surgical outcomes generated when iUS was employed are probably equivalent to those generated by other used intraoperative techniques during epilepsy surgery.

## Spine

ePoster presentation

How to adapt to endoscopic spinal surgery, flatten the learning curve and make it part of everyday practice

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**Objectives:** To ease the learning curve for the spinal surgeon wanting to introduce endoscopy in his spinal practice.

**Background:** As a early Spinal endoscopic surgeon starting in 2015, it has been very difficult to establish endoscopy in the daily spine surgery practice. There were many factors that could have been foreseen en eliminated to have a faster efficient practice, in a shorter time than we did.

**Methods:** We have evaluated all the factors, and would suggest a much different approach to what we went through. The biggest problem in adapting to new technology is introducing it into your daily practice. Endoscopy is disruptive in many ways, and the learning curve makes it a slow process, which most surgeons will not see through.

Not being convinced of the benefits, will be the first stumbling block , with the cost of instrumentation availability and support lacking as well.

Endoscopy should not be seen as either or. There is a wide spectrum of MIS surgical approaches ranging from bigger tubes , to endoscopic assisted smaller tubes, to bigger stenosis endoscopes to smaller diagnostic endoscopes. The interchangeability of these systems, makes it easy to start at a comfort level , and never attempt surgery that is out of the scope of the surgeon's experience. The endoscopic part of each case can be adapted to the surgeon's expertise, and reevaluation can be done throughout the whole combined procedure.

This aspect reduces the stress on the surgeon , and leads to daily or more regular use of the endoscopic systems.

If navigation is employed the learning curve is further flattened and eased.

**Results:** Endoscopic surgery can be mastered in 6 months to a year, with a practical approach.

**Conclusions:** Endoscopy is essential and should be mastered, if the surgeons wants to do spinal surgery in the next 10 years.

## Oncology

Oral presentation

Free-hand frameless electromagnetic-navigation (AXIEM™)- guided brain lesion biopsies: an institution based experience from a low-middle-income country

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**Objectives:** To evaluate the precision and safety of a novel technique to biopsy deep seated space-occupying lesions (SOLs) in the brain through free-hand frameless AXIEM™-based navigation guided system in a low-middle-income country.

**Background:** Although not new, neuronavigation is the focus of interest among Pakistani neurosurgeons. Intracerebral lesions not manageable by open surgery could be investigated for management by neoadjuvant and adjuvant modes of treatment. This retrospective study examines accuracy and safety of AXIEM™-based free-hand, frameless biopsy in the management of deep brain space-occupying lesions (SOLs) which are not accessible for surgical excision.

**Methods:** This retrospective study included 45 patients who underwent free-hand frameless AXIEM™-based navigation guided biopsy of deep seated SOLs in the brain using the Medtronic-Stealth S7 system over a 4-year period (January 2019 to December 2022) at the Department of Neurosurgery Unit-III, Punjab Institute of Neurosciences, Lahore, Pakistan.

**Results:** A total of 45 patients were included in this study. Mean age was  $47.29 \pm 17.192$  SD. Mean time for procedures was  $37.87 \pm 9.6$  SD. There were 28 (62.2%) male and 17 (37.8%) female patients. Sixty percent patients had lesions in basal ganglia, followed by deep lobar lesions in 17.8% cases. Size of lesions was 1 to 2 cm in 29 (64.4%) cases. Right sided lesions were common in 44.4% patients. Most cases were performed under local anesthesia with intravenous sedation (48.9%). Biopsy results were successfully diagnostic in 40 (88.9%) and non-diagnostic in 5 (11.1%) patients. Glioblastoma WHO Grade IV was seen in 20 (44.4%) patients. Asymptomatic minor haemorrhage was seen in 3 (6.7%) patients, massive haemorrhage in 2 (4.4%), hydrocephalus in 1 (2.2%), surgical site infection in 1 (2.2%) and 38 (84.4%) patients had no complications.

**Conclusions:** AXIEM™-based Medtronic-Stealth S7 is a quick, reliable, and secure neuronavigation system for taking a free-hand, frameless biopsy of deep seated SOLs in the brain.

## Neurovascular Surgery

Oral presentation

Approaching deep-seated lesion and bleedings with tubular retractor system: case series of 28 patients treated in a single centre institute

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**Objectives:** The study aims to describe the possible advantages of minimally invasive approach with tubular retractor for deep-seated lesions.

**Background:** Accessing deep-seated lesion represents a challenging problem because of the white matter related dissection morbidity. Therefore, in the last decade the utilization of tubular retractor device has become more common. The primary disadvantage is the narrowness of the surgical corridor and the limited manoeuvrability.

**Methods:** We report 28 patients with deep-seated lesions operated with a tubular retractor device (April 2020 - December 2022). Depending on lesion type:

- Group-A: brain lesion (9 patients: 4 glioma, 2 metastasis, 1 intraventricular meningioma, 1 radionecrosis, 1 cavernoma);
- Group-B: spontaneous bleedings (19 patients).

In group A patients and in 8 patients of group B we performed surgery with neuronavigation system. In 4 patients neurophysiological monitoring assistance was performed. Follow-up protocol: MRI on day 1 and every 3-6 months according to histology in group A; CT on post-operative day 1, day 30 and at 6 months in group B.

**Results:** In group A we achieved gross total resection in 6 cases. In 2 cases the resection was stopped because of CST identification at 3 mA. In 1 patient (cavernoma) a reintervention was necessary because of a significant residual. We observed no permanent deficit. In group B, all patients operated with neuronavigation support showed a major clot evacuation (> 2/3 of the initial volume); only in 7 out of 11 without neuronavigation. Group-A median hospitalization time was 4 days; Group-B median ICU hospitalization time was 3 days.

**Conclusions:** Minimally invasive surgery with tubular retractor system allows a safe resection of these lesions with optimal resection rates. In particular, we observed better radiological results when the tubular device was combined with neuronavigation (especially in deep-seated bleeding). Actually, this approach is associated with short hospitalization-time with considerable implications in hospitalization related costs.

## Spine

ePoster presentation

### The endoscopic approach to lumbar spinal stenosis: anatomy reconsidered

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**Objectives:** To re evaluate our understand of lumbar spinal anatomy, for endoscopic spinal surgery.

**Background:** Our working knowlegde of the lumbar anatomy is very much dependent on the surgical approaches we use, and certain facts are excepted and has not been challenged in the last 50 years.

With the advances of navigation and endoscopic techniques, the approaches to the spine has become more pathology driven, limiting approach related morbidity.

We look at anatomical studies of Kambin's triangle, which was initially described for an endoscopic approach in 1990, as there are certain factors that need to be understood to be safe.

Although the degenerative changes in the facet joints and discs are well known, the reaction of the ligamentum flavum and it's anatomy is misunderstood, with central canal stenosis seldom present. The superior migration of the superior facet, with the anatomical association of the ligamentum flavum leads to maximal stenosis in the axilly of the nerve roots and blind area of Mcnab. This has been shown in the anatomical study of Konagawa et al in 2016.

These factors has made the transforaminal endoscopic approach to spinal stenosis an option in the experienced hands, and the possibility of awake surgery in these patients will make this a option to consider, with the transforaminal approach less invasive and more efficient than the interlaminar approach. ( S Osmann 1996)

We will also briefly show and exexample of the newer endoscopically transforaminal decompression for spinal stenosis.

**Methods:** Medline search of anatomical studies.

**Results:** A lot of misconceptions has been re published over the years . We need to approach more pathology based, without collateral damage.

**Conclusions:** Lumbar spinal anatomy has been seen through the eyes of a midline open surgery, we need to reevaluate the real anatomy for minimal invasive approaches.

## Functional

ePoster presentation

Prediction of diagnostic accuracy of stereotactic biopsy by insertion of air and developing a uniform grading system for reporting

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**Objectives:** We demonstrate the safety and accuracy of air insertion in biopsy procedures (frame & frameless) in a large series. The grading also allows uniform reporting across series and eliminates the chance of up/downgrading the report due to wrong site sampling within the lesion.

**Background:** Stereotactic biopsies are a relatively safe and reliable way to obtain tissue diagnosis of brain lesions. However, predicting the accuracy of the site of biopsy with the desired/planned site is not always possible. We describe a technique to identify the precise location of the biopsy site in the postoperative CT scan using the injection of a low volume of air into the biopsy cannula which enables the grading of accuracy and correlation with histopathology.

**Methods:** 100 consecutive biopsies were performed in 80 adults and 20 children (59 males and 41 females, median age 51 years) over a 3yr period. Frameless biopsy was performed in 75 cases, and frame-based biopsy in 25 cases. After the biopsy specimens had been collected and with the biopsy needle tip in the center of the target, a small volume of air (median 1 cc) was injected into the site. Post-operative CT was done within 4hrs of the biopsy to see the target site and site of air.

**Results:** Intracranial air in the selected target was present in 95 patients (Grade 1 & 2) while the air was seen either in the track (Grade 3) in 3% and at an unrelated site (Grade 4) in 2% of cases. Both Grade 4 biopsies were negative, overall diagnostic yield of 98%. No complications or new onset seizures were found, 7 asymptomatic hemorrhages and 1 case of increased edema, none required surgery.

**Conclusions:** The air-injection maneuver proposed for use in stereotactic biopsies of intracranial mass lesions is a safe and reliable technique that allows the exact biopsy site to be located without any related complications.

## Functional

ePoster presentation

### A novel radiosurgical treatment: frameless radiosurgery for spasticity

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**Objectives:** Frameless LINAC radiosurgery was performed on selected spinal nerve roots to relieve severe spasticity. Preliminary results are reported here.

**Background:** Spasticity and related pain are common and debilitating long-term complications following brain/spinal cord lesions. Conventional surgical treatments such as baclofen pumps and selective dorsal rhizotomy (SDR) are effective but offered to a limited number of patients. Radiosurgery is a novel treatment option recently described for the treatment of spasticity.

**Methods:** Seven patients with refractory spasticity and related pain due to traumatic brain and/or spinal cord injury, brain and/or spinal cord surgery and stroke underwent stereotactic irradiation of selected cervical or lumbar roots. The treatment was delivered to the post-ganglionic sensory segment of cervical roots or to the dorsolateral sensory region of lumbar roots. Selection of the irradiated roots was based on somatotopic distribution of spasticity and related pain as well as EMG findings. Modified Ashworth Scale (MAS) and Visual Analogue Score (VAS) have been used to assess spasticity and related pain levels before and after the procedure.

**Results:** The treatment was well tolerated. Marked symptomatic relief of spasticity and pain was found in all the patients treated. After 2 years, the median reduction of MAS score was 50%. The mean reduction of MAS and VAS was, respectively, 43.7% and 64.3%.

**Conclusions:** LINAC radiosurgery delivered to spinal nerve roots appears to be a safe and effective non-invasive treatment for patients with spasticity and pain caused by brain or spinal cord injury. This technique provides a useful option for the treatment of a wide variety of patients suffering from the long-term sequelae of neurological injury and can broadly expand the ability to treat patients currently orphan of treatment. A randomized, sham-controlled prospective study is underway.



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## Spine

ePoster presentation

### Lumbar back and leg pain

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**Objectives:** To re evaluate our approach to lumbar back and leg pain. Teachings are a legacy, and newer understanding of pain and pathology, with treatment options need to be evaluated for a better outcome.

**Background:** Treating low back pain has been dogmatic over the last 50 years, with conservative treatment, fusion or decompression. Over the years experience has taught us, that we operate for quality of life and pain, and that neurological deficits are less commonly seen, and emergency surgery are seldom needed.

As our understanding of the pathology and pain structures increased, we need to re evaluate our approach to this problem.

Back and leg pain results from chemical irritation of the 3 nerve structures supplying the lumbar vertebral segment.

Although pain is perceived early with irritation of these nerve structures in disc and facet pathology, clinical signs comprising of a SLR and weakness are only seen with nerve root compression, and thus later in the degenerative pathway.

With disc pathology ,leaking of cytokines into the area of the nerve structures, leads to chemical irritation, with pain distribution dependend on the area of leaking. The process leads to vasculization and neurotization of this area , and depending on the healing process can become chronic.

These early reactions are commonly not seen on routine MRI with only 20% of patients showing pathology to treat surgically.

Although we are treating patients conservatively , and at times 6 months or longer, it is seen that the chronic chemical irritation leads to permanent neurological deficits, even with full resorbsion of herniations in cases.

**Methods:** Researching pain factors and treatment over the last 50 years.

**Results:** Back and leg pain can be treated earlier , less invasively and more efficient.

**Conclusions:** Low back and leg pain should be reevaluated.

## Oncology

ePoster presentation

### Late diagnosis of tuberous sclerosis complex associated with cystic brain tumour

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**Objectives:** To describe a case of late diagnosis of tuberous sclerosis complex (TSC) associated with cystic brain tumor in a 37 year old patient. To discuss clinical features, management of this entity.

**Background:** TSC is a rare (1 in 10,000 live births) inherited neurocutaneous disorder, associated with pleomorphic features involving many organ systems, including tumors of the brain, skin, heart, lungs, kidneys and liver, epilepsy, neuropsychiatric disorders.

**Methods:** We report a case of 37-year-old female who was admitted to Emergency Department with 13 seizures in 24 hour time period, unconscious, Glasgow Coma Scale score 5, more recent right sided hemiparesis, inability to speak. Patient had history of cerebral palsy, epilepsy, typically 5-10 seizures a month since 5 months of age, mental retardation, birth trauma, which was previously considered a cause of her neurological, neuropsychiatric condition. Head magnetic-resonance imaging revealed calcified lesion in the left basal ganglia and thalamus, with cystic structures and vasogenous edema surrounding it, dilatation of the lateral ventricle, demyelination in frontal lobe, calcified periventricular lesions in right hemisphere. Chest, abdomen computed-tomography revealed cystic lesions in both lungs, kidneys and liver. On physical examination hypopigmented macules on legs, scalp, angiofibromas on face, shagreen patches on lower abdomen and back were noted. Radiological, clinical features were consistent with TSC. It was decided to perform resection of the intracranial lesion.

**Results:** The patient underwent resection of the intracranial lesion in the left hemisphere, total resection was achieved. Histopathological examination revealed diagnosis of subependymal giant cell astrocytoma, consistent with TSC. Two weeks later patient was discharged with partial improvement in overall condition, neurological status.

**Conclusions:** TSC is a rare, genetic, multisystemic pathology, associated with benign tumors in brain and other vital organs, neurologic and neuropsychiatric conditions. Diagnosis of TSC can be missed in people with birth trauma and its associated disorders.

## Global Neurosurgery

Oral presentation

Intraoperative ultrasound navigation in neurosurgery – using less for more!!

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**Objectives:** Through a series of cases, we provide an appraisal on the application of intraoperative ultrasound as a neuro-navigation tool. We also outline the benefits and limitations of using IUS in Neurosurgery.

**Background:** In today's modern neurosurgery, practical and effective intraoperative image navigation techniques are essential. Despite the availability of ultrasound devices in many centers in middle and low income countries, its value in neurosurgery is still underutilized.

**Methods:** We took a retrospective approach for this investigation, and it involved the extraction of data on neurosurgical procedures that were performed at the Federal Center of Neurosurgery, Tyumen, Russia. We provide a summary of the neurosurgical procedures performed in our center utilizing intraoperative ultrasonography as the primary neuro-navigation tool to locate lesions, their anatomical relationships, surgical cavity following resection, technical challenges and postoperative complications.

**Results:** Navigation with intraoperative ultrasound in neurosurgery serves to aid resect lesions more precisely, safely and in real time.

**Conclusions:** The application of iUS in neurosurgical practice will continue to evolve in the face of improvements in surgical techniques. The availability of ultrasound devices in many centers in middle and low income countries should stimulate neurosurgeons to use it as a neuro navigational tool.

## Spine

Oral presentation

C0-C2 fracture: is occipitocervical fixation avoidable? Surgical treatment and clinical results of 209 patients operated in a single centre institute

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**Objectives:** This retrospective study aims to define when this C1-C2 Goel-HArms Fixation could guarantee a satisfying vertebral stability without Occipitocervical fixation.

**Background:** C1-C2 Goel-Harms fixation represent a surgical challenge due to the proximity of the neurovascular structures. In the literature several works report different outcomes in terms of biomechanical stability and fusion rates.

**Methods:** Between January 2008 and January 2022, 209 patients underwent C1-C2 Goel-Harms fixation because of C0-C2 unstable fractures. We routinely performed cervical spine CT and CT angiography; in complex cases we completed with cervical spine MRI. We provided post-operative follow-up as follows: CT on day 1, radiography at 1 month, CT at 3 and 12 months. Follow-up was at least 1 year.

**Results:** Median age: 75 years; 128 male, 81 female. The indications included (according to Anderson/D'Alonzo Classification): isolated C2 fractures type IIa (24,9%), IIb (19,1%), IIc (32,1%), type III (23,9%). The combination with Atlas fractures was observed in 98 patients (anterior arch, posterior arch, both arches and Jefferson fractures respective in 41, 23, 25, 9). Mean post-operative observation time: 5 days. Complications were seen in 15 patients (7,2 %); infections (6 patients), vertebral artery injury (4 patients), Arnold neuralgia related to C2 root irritation (3 patients), screws malposition (2 patients); revision surgery was performed in 12 patients. We had no post-operative cranio-cervical instability and therefore no occipitocervical fusion surgery was performed during the follow-up.

**Conclusions:** To our experience, we consider the posterior C1-C2 Goel-Harms Fixation as the gold standard treatment in case of C0-C2 unstable fractures, offering an optimal biomechanical stability avoiding occipitocervical fixation. The latter could therefore represents a surgical overtreatment with uncomfortable consequences for the patient (e.g. cervical range of motion reduction). However, we suggest a careful clinical and radiological follow-up for at least 1 year in order to exclude cranio-cervical instability.

## Functional

Oral presentation

Comparison of directional leads vs omni directional leads in bilateral subthalamic nucleus (STN) deep brain stimulation (DBS)

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**Objectives:** To ascertain the differential efficacy of directional vs non directional leads in bilateral subthalamic nuclei (STN) deep brain stimulation (DBS).

**Background:** Directional leads is a new horizon in electrical neurostimulation which allows the current to be directed in a precise way to a specific target for individualized motor examination findings, such as speech, facial expression and rigidity. For achieving stimulation spatially far from one another situated areas directional leads with segmental contacts having single modulating control or multiple independent source controls can be used, which allows us to achieve broader spectrum of symptomatic relief in traditionally resistant to stimulation areas with least side effects.

**Methods:** We conducted a retrospective cohort study at the Department of Neurosurgery, Unit-III, Punjab Institute of Neurosciences, Lahore, Pakistan from 2018 to 2023. Fifty one patients were recruited through non-probability based consecutive sampling.

**Results:** We had 20 (80%) males and 5 (20%) females in directional group vs 3 (12.5%) females and 21 (87.5%) males in non-directional group. Directional leads group patients had mean age of  $56.64 \pm 13.51$  and non-directional group had  $56.96 \pm 11.68$  mean age of distribution, Mean duration of disease for both the groups was  $11 \pm 3.13$  and  $9.2 \pm 3.21$  respectively. Levodopa Equivalent Daily Dose (LEDD) was reduced in directional group by 60.34% and 47.67% in non-directional group which was 12.67% more reduction seen in directional leads group. Directional leads group showed 80.5% improvement in UPDRS III and 77.5% improvement in non-directional group which is 3.0% more improvement in directional vs non-directional group. UPDRS IV showed no improvement. Reduction in time spent with dyskinesia was witnessed to be 45.9% in directional and 50% in no directional leads group.

**Conclusions:** The introduction of directional leads in deep brain stimulation benefits clinicians regarding achieving more widely dispersed brain areas with minimum unwanted stimulation and addressing wide spectrum of symptoms.

## Skull Base

Oral presentation

### Recovery of early post-operative facial weakness in vestibular schwannoma surgery

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**Objectives:** To increase our understanding of the facial nerve recovery pattern after VS surgery and improve intra-operative decision making.

**Background:** An anatomically intact facial nerve, stimulating at its brainstem exit zone, intra-operatively, is a predictor of long-term function.

**Methods:** Retrospective analysis of patients operated for vestibular schwannoma between 2011-2021. Patients were divided into 3 groups based on intra-operative stimulation threshold of the facial nerve: 0.05mA, >0.05mA and no stimulation. Post-operative facial nerve function was classified by House-Brackmann scale (HB). Early facial outcome (first 48 hours) and final facial outcome (minimum 1-year follow-up) was recorded.

**Results:** 408 patients were included. Mean tumour size was 23.5mm.

First group consisted of 362 patients with intraoperative threshold of 0.05mA. 226 patients had initial HB1-2 of which 222 (98%) remained stable at follow-up. Early HB3 was recorded in 66 patients, of which 58 (88%) recovered to HB1-2. Early HB4/ 5 was recorded in 53 patients, with 39 (74%) retaining VII function. Of the early complete palsy group (n=14), only 4 (24%) did not recover.

Second group (threshold >0.05mA) included 24 patients, of which 20 developed some degree of early palsy (4% HB3, 40% HB4-5, 46% HB6). Only 1 patient deteriorated to complete VII palsy from early HB 4-5 and all patients with early complete palsy improved (67% to HB2).

Finally, in the conduction block group of 22 patients, 2 had early normal function and 18 (82%) developed early severe to complete palsy. Only 1 patient deteriorated (HB3 to HB4) and only 5 (23%) had HB6 function at late follow-up. No other factor, including size, or comorbidities, was correlated to the outcome

**Conclusions:** Intra-operative facial nerve condition is a predictor of eventual facial nerve outcome and is a reliable guide to intra-operative decision-making and patient counselling post-operatively. Even with early weakness, a preserved nerve is expected to recover to some degree.

## Skull Base

Oral presentation

### Management of jugular foramen meningioma: a single institution outcome study

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**Objectives:** A retrospective analysis of our results over a decade with microsurgery of jugular foramen meningioma are presented.

**Background:** Primary jugular foramen meningiomas (JFMs), a subtype of CPA meningiomas, are extremely rare, accounting for only 0.7- 4% of all posterior fossa meningiomas and less than 1% of all intracranial meningiomas. A relatively higher prevalence is noted with neurofibromatosis. Despite being pathologically benign, these are locally aggressive, spreading into multiple compartments. The available options include microsurgery, radiosurgery, and watchful observation.

**Methods:** Between 2010-2022, nine patients with Jugular foramen meningioma had microsurgery by the senior author in a single institution. The medical and imaging records for all the patients were reviewed and the results were analysed.

**Results:** The study involved 9 cases, with a mean age of 51.34 years and a male to female ratio of 6:3. Of these cases, 7 had primary cerebellopontine angle extension, while the remaining 2 were foraminal JFMs. The preferred approach was the retrosigmoid approach. A gross total and near-total resection (90% or more) was achieved in 66.67% of the cases. Two cases underwent Gamma Knife radiosurgery during the follow-up period. The mean follow-up in months was  $\pm$  SD  $14.34 \pm 6.79$ . Despite 55.6% of patients experiencing new cranial nerve deficits postoperatively, each of them made a near-complete recovery during their last follow-up.

**Conclusions:** JFMs are uncommon lesions with variable presentations and mostly have an indolent course. Important factors in deciding the strategy are neurological status of the patient, comorbidity, age and duration of symptoms before presentation. JFMs are difficult lesions to manage and a judicious approach towards management of these lesions considering microsurgery or stereotactic radiosurgery or if need be combined treatment should be considered.

## Functional

ePoster presentation

Effect of bilateral subthalamic nucleus (STN) deep brain stimulation (DBS) on drug reduction for Parkinson's disease: an observational study

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**Objectives:** To determine the effect of Bilateral Subthalamic Nucleus (STN) Deep Brain Stimulation (DBS) on drug reduction for Parkinson's disease (PD) in a low-middle-income country.

**Background:** DBS is highly effective in Levodopa-responsive Parkinsonism. DBS decreases drug potency and dosing, while improving patients' quality of life at the same time. Our center is the only public sector hospital in Pakistan providing DBS to the patients of Parkinsonism.

**Methods:** This retrospective study included 51 patients who underwent bilateral STN DBS at the Department of Neurosurgery Unit-III, Punjab Institute of Neurosciences, Lahore, Pakistan over 5 years. Patients meeting the inclusion and exclusion criteria (49 patients) were selected and the effect of bilateral STN DBS on drug reduction was evaluated.

**Results:** Levodopa equivalent daily dose (LEDD) and Unified Parkinson's Disease Rating Scale (UPDRS)-III results were statistically significant, with a P value of 0.0001. And for UPDRS-IV, it was 0.2751, which is statistically insignificant. LEDD reduced by 55.03% ( $P < 0.0001$ ), UPRS-III improved by 80.49% ( $P < 0.0001$ ), and UPDRS-IV improved by 1% ( $P < 0.0001$ ).

**Conclusions:** When the disease is in its early stages and has not yet manifested advanced parkinsonism symptoms, bilateral STN DBS has significant benefit in terms of improvement in motor symptoms along with considerable reduction in levodopa requirement.



## Spine

ePoster presentation

Surgical syrinx fenestration in post-traumatic syringomyelia using a goretex-patch: a new surgical alternative to reduce syrinx recurrence?

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**Objectives:** The aim of our study is to present an alternative syrinx-fenestration technique using a gore-tex patch in order to reduce adherence formation and syrinx recurrence.

**Background:** Progressive post-traumatic cystic syringomyelia refers to an uncommon complication potentially associated to neurological deterioration after spinal cord injury. Despite different surgical strategies, often the clinical outcome is unsatisfactory and multiple operations are required.

**Methods:** We report a case of a 24-year-old young lady who underwent in July 2013 a dorso-lumbar arthrodesis because of a L1 fracture with conus medullaris compression. During radiological follow-up we documented a progressively increasing syringomyelia associated with trunk sensory impairment. Therefore, in November 2019 the patient underwent a surgical syrinx-fenestration at L1 level. The patient experimented a transient improvement of the symptoms. Since March 2020 the woman referred a progressive increasingly spasticity in lower limbs and trunk paraesthesia with irradiation in both upper extremities. The radiological check documented a syrinx recurrence with cranial extension until the bulbospinal junction. On MRI the conus medullaris appears posteriorly adherent to the dura mater. In January 2022 the patient underwent a second surgical syrinx-fenestration at L1 level. A goretex-patch was sutured to the pia in order to create a non-adherent film between spinal cord and dura mater.

**Results:** At the clinical check at 3 months the patient referred consistent reduction of paraesthesia in upper extremities and minimal persistence of spasticity in lower extremities. The postoperative MRI at 12 months showed the complete disappearance of the syrinx and the patient achieved complete symptoms resolution.

**Conclusions:** Post-traumatic syringomyelia is burdened by high incidence of surgical failure due to adherence formation. To our opinion, interposing a non-adherent tissue as goretex between spinal cord and dura mater is an interesting surgical strategy to reduce adherence formation and syrinx recurrence.

## Neurovascular Surgery

ePoster presentation

### Young hypertension and spontaneous intracranial haemorrhage in Singapore: a retrospective study

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**Objectives:** We aim to investigate the prevalence of young patients with hypertensive intracranial hemorrhage and to explore if hypertensive electrocardiogram patterns can be used to predict the likelihood of these patients requiring neurosurgical intervention.

**Background:** Hypertension is known to cause intracranial hemorrhage. Recent studies have shown an increased incidence of hypertension among the younger population. However, the prevalence of these young adults suffering from intracranial hemorrhage remained unclear.

**Methods:** We performed a retrospective study investigating patients with intracranial hemorrhages presented to National University Hospital, Singapore in year 2019 – 2020. Young hypertension was defined as aged less than 50 years old. Patients with systolic blood pressure (SBP) higher than 140 with no other apparent causes for intracranial hemorrhage were included. Patients with identifiable causes for intracranial hemorrhage such as trauma and vascular abnormalities were excluded. Hypertensive electrocardiogram pattern (left ventricular hypertrophy) was identified using Sokolow-Lyon criteria.

**Results:** 325 patients with hypertensive intracranial bleeding were identified. 18.8% (n=61) of patients are aged 50 and below. The median age of young patients is 44. The mean SBP of young patients is 192. 52.5% (n= 32) of these young patients were not previously diagnosed with hypertension. 31.1% (n=19) of young patients required surgery. 45.9% (n=28) had left ventricular hypertrophy (LVH) patterns on electrocardiogram (ECG). 39.3% (n=11) of young patients with ECG changes needed surgery and 24.2% (n=8) of young patients without ECG changes needed surgery. Chi-Square test was performed and showed no statistical significance between these 2 groups (p = 0.32).

**Conclusions:** 18.8% of patients with hypertensive intracranial bleeding are of the younger population. Although hypertensive electrocardiogram patterns do not predict the likelihood of them requiring surgery, early detection is crucial for prevention and this may be done by ECG screening as 45.9% of young hypertensive intracranial bleed patients had left ventricular hypertrophy (LVH) pattern on ECG.

## Epilepsy

ePoster presentation

### Clinical and anatomical analysis of epileptogenic spread patterns in Focal Cortical Dysplasia patients

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**Objectives:** Herein we aim to describe using cadaveric illustration of post-operative side effects white matter tracts implicated by Focal Cortical Dysplasia Lesions.

**Background:** Focal cortical dysplasia (FCD) is one of the main causes of intractable epilepsy, which is amendable by surgery. During the surgical management of FCD, the understanding of its epileptogenic foci, interconnections and spreading pathways is crucial for attaining a good postoperative seizure free outcome.

**Methods:** We retrospectively evaluated 54 FCD patients operated in Federal Center of Neurosurgery, Tyumen, Russia. The EEG findings were correlated to brain anatomical areas. Subsequently, we analyzed the main white matter tracts implicated during the epileptogenic spreading in some representative cases. We prepared 10 human hemispheres using Klinger's method and performed white matter fiber dissection.

**Results:** We illustratively described the main white matter tracts implicated in the seizure spread in 10 patients. Respective FCD foci, interconnections and ectopic epileptogenic areas in each patient were discussed.

**Conclusions:** A strong understanding of the main implicated tracts in epileptogenic spread in FCD patient remains cardinal for epilepsy neurosurgeons. In order to achieve meaningful seizure freedom, despite the focal lesion resection, the interconnections and tracts should be understood and disconnected to stop the spreading.

## Skull Base

ePoster presentation

Practicing skull base surgery in non institutional, resource limited peripheral centre in India

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**Objectives:** Author present his work on skull base tumors and vascular lesions, involving all area in brain and very complex locations with limited resources at a peripheral neurosurgical centre in India.

**Background:** Skull base surgery is complex, technically demanding and usually practiced at major neurosurgical institutions.

**Methods:** Over a period of 20 years, we have operated all kinds of skull base pathologies involving anterior, middle and posterior skull base including complex vascular lesions, successfully with comparable results in basic neurosurgical set up, which includes basic microscope, micro instruments, bipolar and suctions, neurosurgical table, Mayfield head fixation and a dedicated neurosurgery operating room etc. There was no navigation, no CUSA or high end microscope, no intraoperative monitoring and no skilled manpower to assist in work for first 10 years. Various lesions included skull base meningiomas, vestibular schwannomas, cavernous sinus tumors, pituitary adenomas, craniopharyngiomas, petroclival meningiomas, foramen magnum meningioma, proximal ICA aneurysms, basilar aneurysms, pineal and tentorial tumors, etc. We will display representative cases during the conference.

**Results:** Over past 8 years, we evolved with technological advancement like CUSA, better microscope and neuronavigation but still not equipped like many advanced centres in the country and abroad but a variety of skull base lesions are being operated successfully with comparable results.

**Conclusions:** Limited resources are not a constraint to operate any of the skull base tumours with basic neurosurgical techniques and excellent results can be obtained. One must have required technical skill and willingness to perform in such circumstances.

## Skull Base

Oral presentation

### Venous thromboembolism chemoprophylaxis after Skull Base surgery

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**Objectives:** To assess the efficacy and safety of venous thromboembolism (VTE) chemoprophylaxis following skull base operations.

**Background:** Lack of guidance in current literature surrounding postoperative VTE prophylaxis using pharmacological agents (chemoprophylaxis) in patients undergoing skull base surgery.

**Methods:** Review of prospective quaternary centre database including adults undergoing first-time skull base surgery (2009-2020). VTE was defined as deep vein thrombosis (DVT) and pulmonary embolism (PE) within 6 months of surgery. Multivariate logistic regression was used to determine factors predictive of postoperative intracranial haematoma/VTE. Propensity score matching (PSM) was used in group comparisons.

**Results:** 1551 patients were included with a median age of 52 years (range 16-89 years) and female predominance (62%). Postoperative chemoprophylaxis was used in 81% of patients at a median of 1 day postoperatively. There were 12 VTE events (1.2%) and use of chemoprophylaxis did not negate the risk of VTE entirely ( $p > 0.99$ ) and was highest on/after postoperative day 6 (9/12 VTE events). There were 18 intracranial haematomas (0.8%) and prior chemoprophylaxis was associated with a significantly reduced incidence of haematoma formation (OR=0.17, 95%CI=0.07-0.45,  $p < 0.001$ ). After PSM, chemoprophylaxis did not significantly increase the risk of an intracranial haematoma ( $p > 0.99$ ). Patients administered chemoprophylaxis from postoperative day 1 and 2 had similar rates of intracranial haematomas ( $p = 0.60$ ) and VTE ( $p = 0.60$ ), affirmed in PSM.

**Conclusions:** Postoperative chemoprophylaxis represents a relatively safe strategy in patients undergoing skull base surgery. We advocate a personalised approach to chemoprophylaxis and recommend it on postoperative day 1 or 2 when indicated.

## Skull Base

ePoster presentation

### The place of surgery in the management of prolactin secreting adenomas

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**Objectives:** This study is aimed to define what is the role of pituitary surgery in the current setup of prolactin secreting adenomas management.

**Background:** Surgery has lost a lot of ground as the main therapy of most prolactinomas (PRL) as it is clear from the current guidelines in most prolactinomas, even in the setting of optic compression. However, we believe that surgery is still an important part in the treatment of this type of adenomas.

**Methods:** In this retrospective, single-center study we retrospectively reviewed the medical records of 298 patients that underwent surgery for pituitary adenoma between Jan 2013 and Dec 2022 at "N. Oblu" Clinical Emergency Hospital. We identified 12 patients who underwent endoscopic transsphenoidal surgery (ETSS) for a prolactinoma. Surgical indication, previous dopamine agonist (DA) treatment, remission rates, surgical complications, pituitary function and imagistic appearance are presented.

**Results:** Of the 12 patients included, 4 had giant PRL and 8 macroadenomas, while 9 of them had previous DA treatment. The main indications for surgery in our series were: pituitary apoplexy (5 cases), CSF leak after medical treatment (3 case), DA treatment failure (2 cases) in patients with cystic lesions, one case of DA treatment resistance and one case of doubt regarding secretory status. The main surgical complications were transitory diabetes insipidus in 7 cases. Normalization of prolactin levels was achieved in 2 patients. Visual function improved in 7 patients and remained stable in 5 (4 of them having normal visual acuity).

**Conclusions:** Surgical intervention should be strongly considered in all patients with neurologic symptoms referable to the lesion, resistance to medical therapy, other treatment failure or with complications after DA treatment. The endoscopic endonasal surgery offers good surgical outcomes with low rates of surgical complications and should remain an open option for specific cases.

## Skull Base

Oral presentation

### Multidisciplinary approach to SRS in vestibular schwannomas

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**Objectives:** To evaluate the outcomes of stereotactic radiosurgery (SRS) in vestibular schwannomas (VS) with reference to the factors behind this management decision in a multidisciplinary skull base clinic.

**Background:** Joint surgical and clinical oncology clinic consultations with SRS service offered in the same unit.

**Methods:** Retrospective analysis of all new patients seen in joint clinic since establishment (2013) and patients treated with SRS since installation (Novalis Tx™, 2011).

Demographic factors, imaging/clinical factors and outcomes were recorded.

**Results:** 394 consultations in our multidisciplinary clinic were analyzed. The majority (91.5%) had tumour growth with mean growth rate of 3mm/year. Tumour size was Koos grade 2 in 76% and Koos 3-4 in 12%. Patients <50yo predominantly opted for surgery whilst >50yo chose SRS. Continued scan surveillance was similar in all age groups. Patients with bigger tumours were more likely to have surgery. With solid tumours SRS was the main choice, whereas with cystic tumours surgery and SRS were equally distributed.

264 patients underwent SRS with a mean age at treatment of 65. Mean growth rate prior to treatment was 2.5mm/year. Koos 2 formed the majority of cases, with cystic/microcystic tumours being 71% of treated tumours. Only 5 patients (0.02%) required subsequent surgery or second SRS within a mean follow-up of 50.7 months (18-124 months). Mild post-treatment adverse effects (imbalance, vertigo, tinnitus, nystagmus, facial and trigeminal symptoms) were recorded in a majority of patients, which almost uniformly were self-limiting. There were no serious adverse effects.

**Conclusions:** Multidisciplinary consultation streamlines the patient-experience facilitating appropriate choice of treatment based on clinical and patient-related factors. This is borne out by results from the first decade of SRS in our unit which confirm acceptable treatment tolerance and excellent tumour control.

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## Neurovascular Surgery

Oral presentation

Microsurgical clipping techniques for ophthalmic segment aneurysms (OSA)

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**Objectives:** To analyse results of microsurgical clippings of ophthalmic segment aneurysms and long term outcome.

**Background:** Aneurysms originating from ICA - ophthalmic segment are complex, technically demanding and carries high risk for safe clipping. We would display various clipping techniques for aneurysms in this location.

**Methods:** Author presents his experience of operating 40 OSAs in 39 patients, out of 453 cases of total aneurysms operated, of these last 28 cases were done at a peripheral city hospital. Female outnumbered male and mean age was 45 years. Thirty patients presented with subarachnoid haemorrhage, one with visual deficits and 8 aneurysms were incidentally detected. All patients were in WFNS grade 1-2 except one was in grade 5. Eighteen aneurysms originated from dorsal wall of ophthalmic segment where as 20 were from ventral wall. Aneurysms were classified as small (22), large (16), and giant (2). Thirty four patients underwent microsurgical clipping where as 5 were wrapped and one trapped. Neck carotid exposure for proximal control and drilling of clinoid process for optimal exposure of proximal neck were essential steps.

**Results:** Two operated patients are still in hospital while writing this abstract and doing well. Twenty five patients resumed normal life following treatment and 3 patients were moderately disabled but independent for daily life activities. There were three mortalities. Follow up varies from 3 months to 12 years with excellent neurological status.

**Conclusions:** Microsurgical clipping techniques for OSA are safe and provide durable long term outcome.



## Oncology

Oral presentation

Posterior fossa epidermoids - an analysis of contralateral symptomatology and hydrocephalus

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### Objectives:

- To evaluate the subset of patients of posterior fossa epidermoid presenting with contralateral symptomatology
- To analyze the mass effect & hydrocephalus caused by epidermoid
- To showcase our institutional experience of posterior fossa epidermoid

**Background:** Intracranial epidermoids are rare, benign, congenital inclusion cysts with extremely slow growth and the ability to insinuate cisternal spaces. Despite this, they tend to cause significant mass effect and hydrocephalus. Moreover, they produce ipsilateral compressive/irritative symptoms.

**Methods:** This study included a retrospective analysis of all patients who underwent surgery over the last 22 years for posterior fossa epidermoid. Various study parameters were taken into consideration for the assessment of the above objectives. A P-value of less than 0.05 was considered statistically significant.

**Results:** A total of 147 patients were included with mean age of 34.5 years and male to female ratio of 1.1:1. The mean duration of symptoms was 24.3 months with the most common being cerebellar manifestations (49.7%). Contralateral involvement was noted in 28 patients (19.0%) with the most commonly involved cranial nerve being lower cranial nerves followed by 7<sup>th</sup>. Mass effect was seen in 74 patients (50.3%). Trigeminal neuralgia was significantly associated with those without mass effect (p-value <0.00001). Hydrocephalus was noted in 38 patients (29.5%) with significant association with cranial nerves, brainstem and cerebellar signs. Long tract signs were noted in 22 patients (15%) with significant association with cranial nerves, cerebellum, size ≥4cm, hydrocephalus and need for CSF diversion. Complication rate was 43.5%.

**Conclusions:** We confirm that it isn't uncommon for posterior fossa epidermoid to present with contralateral symptomatology with the possible underlying pathophysiology being brainstem distortion. Hydrocephalus is a well-known, though seldom explored, entity. We affirmed that less than 1/4<sup>th</sup> of these patients required CSF diversion. Our study represents the largest series of posterior fossa epidermoids studied to date analyzing its various characteristics.

## Skull Base

ePoster presentation

### Incidence of cerebrospinal fluid leakage after endonasal excision of giant pituitary adenoma without nasoseptal flap elevation

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**Objectives:** To assess the risk of Cerebrospinal Fluid (CSF) leakage without the use of nasoseptal flap elevation.

**Background:** Pituitary adenomas make up about 16 percent of all brain tumors and Giant pituitary adenomas make up about 4.5 -5 percent of these tumors endonasal endoscopic surgery is a considered a safe technique for the excision of pituitary giant adenomas. The cerebrospinal fluid (CSF) leakage ranges from 6-16 percent even then. The prevalence of CSF leakage following endonasal excision of large pituitary adenomas without nasoseptal flap elevation has not been thoroughly investigated.

**Methods:** After ethical approval, this prospective was conducted at Department of Neurosurgery, Unit, III, Punjab Institute of Neurosciences, Lahore, Pakistan from June 2018 till February 2023. Endoscopic transsphenoidal operations after endonasal excision without or with single or multilayer fascial graft repair in patients with per-operative CSF leakage, but not with the mucocutaneous flap elevation were done. Data was collected for pre- and per-operative CSF leakage, relevant systematic history and post-procedural events.

**Results:** Out of 175 patients, 60% were females. The average age was 40 yrs. Mean tumor size in diameter was 45mm. About five percent patients with CSF leakage required re-intervention in our study, and some had a low flow CSF leakage (8%) and 3.42% had high flow leakage. Pearson co-relation coefficient found increasing CSF leak trend with tumor size but had limited CSF leak patients. Mann Whitney U-test showed significant link between CSF leaked patients and the tumor sizes.

**Conclusions:** Nasoseptal flap elevation a landmark treatment option in literature in controlling CSF leak rates particularly dealing with large tumors but here even with giant macroadenomas proper classical endonasal excision techniques with and without graft reconstruction can give equally effective results in lower middle class countries depending upon the expertise, size and extent of tumor and case selection in such patients which necessitates further research.

## Global Neurosurgery

ePoster presentation

Refractory symptomatic trigeminal neuralgia successfully treated by intrathecal continuous infusion of bupivacaine and sufentanil at C1-C2 level

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**Objectives:** - Treatment of refractory symptomatic trigeminal neuralgia.

- Review of the literature of symptomatic trigeminal neuralgia treatment with intrathecal continuous infusion.

**Background:** Symptomatic trigeminal neuralgia is a challenging clinical situation. Sometimes despite all the treatments available the patients maintain a disabling pain. New treatments need to be explored for these kind of patients.

**Methods:** A patient with incapacitating symptomatic trigeminal neuralgia because of a sphenoid sinus fibromyxosarcoma treated with surgery, chemotherapy and radiotherapy presented with neuropathic pain over the left V2-V3 area. Physical exam revealed V2-V3 hypoesthesia and VI nerve palsy. Electromyography showed partial trigeminal nerve lesion. The last MRI revealed scar tissue invading the hemiclivus and left cavernous sinus with extension the pterygopalatine fossa. The cisternal trigeminal nerve was visualized without alterations. Different treatment modalities as pharmacological treatment, trigeminal block and stellate ganglion block were done but all of them were unsuccessful. Surgical intervention for trigeminal decompression was dismissed.

An initial test with intrathecal morphine at C1-C2 level was realized with optimal result. A second test was done with the same result.

A percutaneous implementation of intrathecal infusion pump was carried out. A second surgery was carried out via C2 laminectomy because of displacement of the proximal catheter. The procedure was done with radioscopy control for the introduction of the proximal catheter in the prepontine cistern. Currently, the patient is under continuous infusion of bupivacaine 30,64 mg/day and sufentanil 12,77 mcg/day.

**Results:** The patient is under excellent control of the trigeminal neuralgia. MRI with good control of the neoplastic lesion.

The X ray showed correct position of the catheter with the tip at the prepontine cistern.



**Conclusions:** The intrathecal continuous infusion of analgesics could be a useful treatment for refractory symptomatic trigeminal neuralgia. Only few reports were described in the literature.

## Neurovascular Surgery

ePoster presentation

Middle cerebral artery aneurysms: critical analysis

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**Objectives:** To analyse results of microsurgical clipping of middle cerebral artery aneurysms.

**Background:** Middle cerebral artery aneurysms are favourable for microsurgical clipping. Usually they have broad neck; involve one or more branches and often have associated ICH.

**Methods:** We present a series of 102 patients with middle cerebral artery aneurysms (MCAAn) operated over a period from 1996 onwards. During this period a total of 431 patients having 453 aneurysms, were treated micro surgically constituting 22.7 % of MCAAn.

Majority of the patients presented with SAH, of which 40 % had associated intraparenchymal hematoma (ICH), and one patient had acute subdural hematoma (SDH). In 97 patients, it was MCA bifurcation aneurysm; whereas 4 patients had distal MCA aneurysms and one patient had M1 aneurysm. There were multiple aneurysms in 26 patients and 8 patients had mirror MCA bifurcation aneurysm. 75 patients were in WFNS grade 1-2, 11 in grade 3 and 16 in grade 4-5. 90 % of the aneurysm were small, 8 large and 3 were giant. All patients underwent microsurgical clipping.

**Results:** Six patients had intra operative rupture of aneurysm which could be controlled with temporary clip. Twelve patient developed vasospasm postoperatively which was successfully managed with triple H therapy and nimodipine infusion with complete resolution. 95 % of grade 1-2 patients had good outcome. Only 25 % had good outcome in poor grade patients. There was mortality of one patient in poor grade group. There was no mortality in grade 1-2 patients.

**Conclusions:** MCA aneurysms are favourable for microsurgical clipping. Excellent outcome is expected in majority of good grade patients. Broad neck aneurysms can be clip reconstructed microsurgically.

## Trauma

ePoster presentation

A delayed presentation of an intercranial haemorrhage as the result of a full thickness electrical brain injury: illustrative case

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**Objectives:** N/A

**Background:** Electrical brain injuries are rare and under-reported. Current literature is comprised of cohorts and cases of individuals who undergo secondary mechanical traumatic brain injuries at the time of electrocution. This makes isolated electrical brain injuries difficult to study. The authors present a case of delayed sequelae of a full thickness electrical brain injury and the nuances in pathophysiology and management.

**Methods:** N/A

**Results:** Observations: A 2-year-old girl sustained an isolated full thickness electrical brain injury. Although initial Computer Tomography (CT) brain scan showed no significant trauma, 9 days later the patient developed an intracranial haemorrhage with significant mass effect and warranted neurosurgical evacuation and decompression. The patient then developed wound dehiscence at the craniotomy site surrounding the full thickness burn. Despite a prolonged hospital course, the patient had a satisfactory clinical outcome.

**Conclusions:** Lessons: The pathophysiology of sequelae in electrical brain injuries are poorly understood. In this case we speculate that venous thrombo-embolic phenomena may play a major role in the delayed presentation of electrical brain injuries. Early cerebrovascular imaging could detect thrombo-embolic complications and Magnetic Resonance Imaging (MRI) is recommended to determine the true extent of injury. Ischemic tissue surrounding electrical brain injury should be anticipated and debrided aggressively to improve post-surgical wound healing.

## Neurovascular Surgery

ePoster presentation

Surgical outcome of ruptured anterior circulation aneurysms: experience from a low-middle-income country

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**Objectives:** To evaluate the surgical outcome of microsurgical clipping for ruptured anterior circulation aneurysms.

**Background:** Subarachnoid hemorrhage (SAH), although rare, is a grave clinical emergency and has an incidence of 9 per 100,000. Ruptured intracranial aneurysm accounts for 85% of the cases of SAH. Rebleeding from the aneurysmal site is one of the most common and deadly complications associated with SAH. Microsurgical aneurysm clipping by open surgery and endovascular technique is implied to prevent complications and improve clinical outcomes in patients with subarachnoid hemorrhage.

**Methods:** This retrospective, cross-sectional study assessed the data of 50 patients who underwent surgical clipping for "ruptured aneurysms" with subarachnoid hemorrhage from May 01, 2022, till May 01, 2023, at the Department of Neurosurgery, Unit – III, Punjab Institute of Neurosciences, Lahore, Pakistan. Information regarding patient demographics, risk factor stratification, pre-operative investigations, intra-operative findings, and postoperative complications was also analyzed.

**Results:** The mean age of patients was  $49.66 \pm 6.231$  years with a female preponderance of 54%. Out of 50 cases, 21 were midline aneurysms (42%), followed by left-sided laterality in 16 cases (32%). Aneurysm of the anterior communicating artery was the most common accounting for 42% of the patients. Hypertension was the most commonly associated comorbidity in 62% of the patients. Forty two percent of the intracranial aneurysms were unilobar. Fifty four percent patients underwent clipping via sub-frontal approach and forty percent via pterional approach. Only one patient had intraoperative rupture of aneurysm, with post-operative hydrocephalus. Forty nine patients returned home on their first post-operative day without deficits.

**Conclusions:** The choice of surgical approach depends on surgeon's preference, patient characteristics, and the location and size of the aneurysm. Meticulous surgical technique and asepsis are responsible for great postoperative outcome.

## Spine

Oral presentation

Deep learning on preoperative radiographs for clinical success prediction after surgery for cervical degenerative disease

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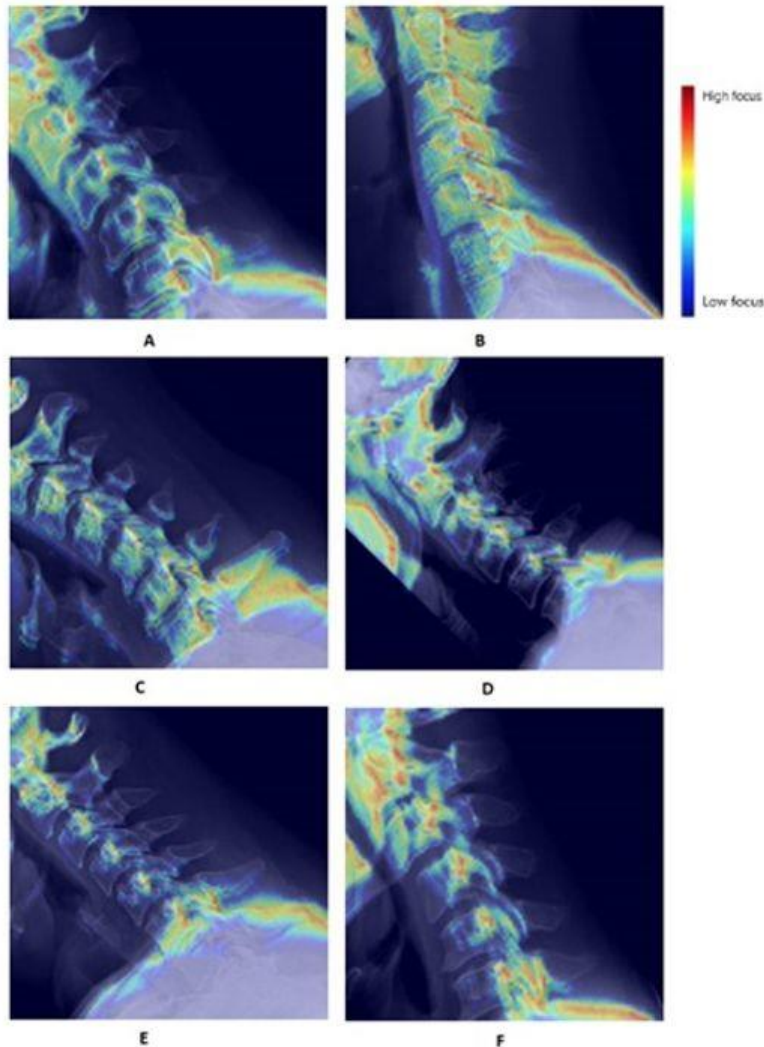
**Objectives:** The purpose of this study was to identify which image features on cervical radiographs are important for the prediction of clinical success one year after surgery for cervical disc disease, by developing and validating a deep learning algorithm that predicts clinical success solely based on the radiograph.

**Background:** As populations age and the prevalence of cervical spine degeneration rises, the demand for computer-aided diagnostics and prognostics in neurosurgery rises. Not all patients benefit from surgical treatment and predicting who will remain challenging. Automating parts of the radiological image analysis process using Machine Learning could provide more accurate, consistent assessment with increased time efficiency, and potentially gain new disease insights.

**Methods:** In this prognostic classification study using RCT data a convolutional Neural Network (CNN) was developed on cervical lateral flexion radiographs. After data augmentation 826 images were used for training and 266 for validation, originating from 70 unique clinical records. All patients had Neck Disability Index (NDI) scores available preoperatively and one year postoperatively, and clinical success was based on previously established cut-off values for NDI. The CNN consists of four convolutional layers and a maximum pooling function. Fivefold cross-validation was performed and Grad-CAM heatmaps were generated for model interpretation.



GradCAM-based heatmaps are provided for four cervical radiographs upon which was accurately predicted by the algorithm that patients would have a successful outcome a, b, c, d and two cervical radiographs based upon which was accurately predicted by the algorithm that patients would not have a successful outcome e and f. The color bar indicates the importance of zones on the images for the network in making a prediction. For prediction of patients who would develop symptoms, the facet joints appeared to be a main focus for the deep learning algorithm.



**Results:**

The model was able to predict clinical success one year after surgery on cervical flexion radiographs with an accuracy of 71%, sensitivity of 80%, and AUC of 0.80. The Grad-CAM heatmaps illustrated the model focused on the facet joints in the classification process.

**Conclusions:** The model showed good discriminative ability. The Grad-CAM heatmaps of this study show significant influence of the facet joints, the only synovial-lined, diarthrodial joints in the spine, in the classification process. There is currently no other method available to predict clinical success based on imaging alone for this clinical scenario.

## Spine

Oral presentation

Comparison of short segment percutaneous transpedicular fixation with and without the inclusion of fractured vertebrae in thoracolumbar fractures

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**Objectives:** To compare the outcome of Short Segment Posterior Fixation (SSPF) with and without the inclusion of fracture vertebrae in thoracolumbar fractures in terms of visual analogue scale (VAS) and vertebral column stability.

**Background:** There are still disagreements on the management and timing of surgery, as well as the technique and kind of surgery for thoracolumbar fractures. Short segment percutaneous transpedicular fixation with and without the inclusion of fractured vertebrae in thoracolumbar fractures has been demonstrated to be easy, safe, and reliable regarding reduction and believed to be the most accepted technique. No local studies exist comparing fixation with and without the inclusion of fractured vertebrae.

**Methods:** The study enrolled 96 patients who were divided into two groups. Group A treated by SSPF (four screws: one level above and below the fracture), and Group B was treated by Posterior Short Segment Fixation with Fractured Vertebra (PSFFV) (six screws: including fractured vertebrae). Assessment of parameters related to clinical and radiological aspects were recorded at third and sixth month of post-operative follow up.

**Results:** Mean ages of patients were 36.96 and 37.41 years in group A (SSPF) and group B (PSFFV), respectively. Mean VAS preoperatively, postoperatively, at 3 and 6 months were 8.78 vs. 9.01, 4.98 vs. 5.01 for group A and 2.08 vs. 2.11 and 0.47 vs. 0.67 for group B, respectively. Mean kyphotic angle preoperatively, postoperatively, at 3 and 6 months were 21.76 vs. 22.91, 11.13 vs.10.16, 13.59 vs.11.16 and 14.88 vs.12.87 in groups A and B respectively.

**Conclusions:** The results of this study favor PSFFV (Group B) over SSPF (Group A) in terms of vertebral column stability which was better achieved in PSFFV. PSFFV was also found superior with no implant failure which declares it safer and more effective than SSPF. None of the techniques was found superior in terms of pain.

## Global Neurosurgery

Oral presentation

It is the child with the big head"- primary healthcare providers' perceptions of paediatric hydrocephalus in Blantyre, Malawi; a qualitative study

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**Objectives:** To explore perceptions and identify enablers and barriers to detection and referral of paediatric hydrocephalus among primary healthcare providers in Blantyre, Malawi.

**Background:** In Blantyre, paediatric hydrocephalus represents the majority of surgical procedures performed in the neurosurgical department at Queen Elizabeth Central Hospital. Late presentation of children with hydrocephalus to treatment centres may result in poor outcomes, and timely detection followed by referral from surrounding primary health centres is therefore crucial to reduce morbidity and mortality.

**Methods:** From February to April 2021, we conducted a qualitative study among primary healthcare providers (n=30) from ten primary health centres in Blantyre district. Using a semi-structured interview-guide, we audio-recorded and transcribed the interviews before conducting a thematic analysis.

**Results:** We identified three key themes. First, healthcare providers had good theoretical knowledge of hydrocephalus and its severity, but compared to other diseases they perceived it to be uncommon. None of the primary healthcare providers mentioned to systematically and routinely monitor head circumference in children. Second, teamwork and communication were reported as facilitating clinical work. The description of the Malawian health passport as a useful clinical communication tool applied by all providers across the different levels of service delivery was unanimous. However, head circumference growth charts are not included in the health passports. Third, barriers to detection and referral included experiences related to contextual health systems constraints such as a high volume of patients, transport challenges, and signs of previous traditional healing efforts.

**Conclusions:** There is a potential to improve detection through head circumference measurements, which is the recommended way to identify hydrocephalus early. To optimize outcomes for paediatric hydrocephalus we suggest including head circumference growth charts in the health passports. To meet the need for comprehensive management of paediatric hydrocephalus, we recommend more research from the continent, focusing on bridging the gap between primary care and neurosurgery.

## Paediatric

Oral presentation

Endoscopic suturectomy via a flexible bronchoscope: a recent, brief history of success in a public pediatric hospital in Mexico

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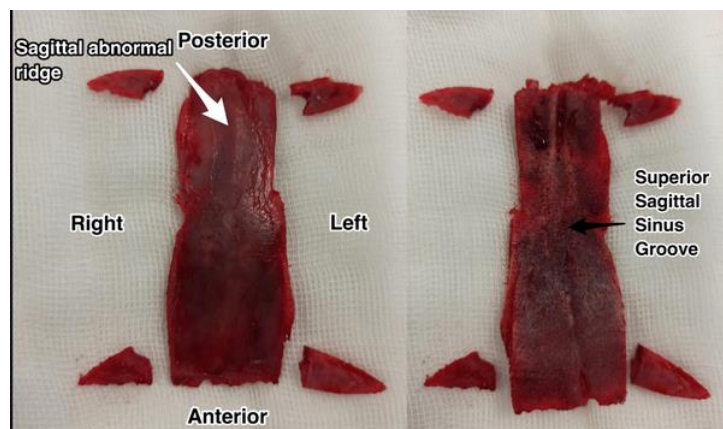
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**Objectives:** To describe the feasibility and good outcomes of performing an endoscope-assisted suturectomy in single, non- syndromic craniosynostosis with the aid of a flexible bronchoscope in a public hospital in México.

**Background:** Non-syndromic single suture craniosynostosis is one of the most challenging and fascinating problems that pediatric neurosurgeons must deal with. There are a vast array of techniques and indications suggested for reach the best outcomes, depending greatly on age of the patient, surgical training and of course the facilities' resources in order to perform different techniques. Since we have no access to a proper neuroendoscopy suite to develop special techniques, we started using a flexible endoscope in order to overdrive this handicap.

**Methods:** We used an EB-530P Fujifilm Flexible bronchoscope, with a distal diameter of 3.8 mm, with a 120 degree field of view and a up-down flexibility of 180/130 degree to perform during 2021-2023 to perform 6 endoscope assisted suturectomies (3 with scaphocephaly, 2 with right coronal and 1 with left coronal plagiocephaly) in children ranged from 2 to 8 months old.

**Results:** 5 of the 6 patients were discharged the next day after the planned strip craniectomy, one of them required a 24 hours stay in the pediatric ICU due to anesthetic complications, however was discharged the next day with no further deficit nor complication. The mean blood loss was 40cc, no one required a blood transfusion, and one month after discharge no one have further neurological deficit and all of them started helmet therapy with excellent molding outcomes.



**Conclusions:** The use of a flexible bronchoscope, despite not being the proper device intended for this use, is a very handful tool to help with a minimally invasive suturectomy with similar results achieved with traditional rigid neuroendoscopes.

## Functional

Oral presentation

Deep brain stimulation in disorders of consciousness: 10 years of a single center experience

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**Objectives:** Our study aims to present the 10 years' experience of a single center using DBS as a therapy on a cohort of patients with DoC.

**Background:** Disorders of consciousness (DoC), namely unresponsive wakefulness syndrome (UWS) and minimally conscious state (MCS), represent severe conditions with significant consequences for patients and their families. Several studies have reported the regaining of consciousness in such patients using deep brain stimulation (DBS) of subcortical structures or brainstem nuclei.

**Methods:** Eighty Three consecutive patients were evaluated between 2011 and 2022; entry criteria consisted of neurophysiological and neurological evaluations and neuroimaging examinations. Out of 83, 36 patients were considered candidates for DBS implantation, and 32 patients were implanted: 27 patients had UWS, and five had MCS. The stimulation target was the centromedian-parafascicular complex in the left hemisphere in hypoxic brain lesion or the one better preserved in patients with traumatic brain injury.

**Results:** The level of consciousness was improved in seven patients. Three out of five MCS patients emerged to full awareness, with the ability to interact and communicate. Two of them can live largely independently. Four out of 27 UWS patients showed consciousness improvement with two patients emerging to full awareness, and the other two reaching MCS.

**Conclusions:** In patients with DoC, spontaneous recovery to the level of consciousness is rare. Thus, DBS of certain thalamic nuclei could be recommended as a treatment option for patients who meet neurological, neurophysiological and neuroimaging criteria, especially in earlier phases, before occurrence of irreversible musculoskeletal changes. Furthermore, we emphasize the importance of cooperation between centers worldwide in studies on the potentials of DBS in treating patients with DoC.

## Paediatric

ePoster presentation

### Paediatric neurosurgery in the Eastern Cape, South Africa: a 5-year experience at Frere Hospital

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**Objectives:** The primary objective was to establish the prevalence of paediatric neurosurgical theatre cases across a five-year period, including: demographics, number and type of procedures, theatre time and to identify the challenges causing delay or cancellation of elective and emergency cases.

A secondary objective was to identify the trend of theatre cases and quantify the impact caused by the Covid-19 pandemic between 2020-2021.

**Background:** There is scant research that examines paediatric neurosurgical services offered by tertiary hospitals in the Eastern Cape. The patient burden, case load, and operative services provided in this area has not been reported on prior to this study.

**Methods:** Retrospective clinical audit of all theatre cases in the Paediatric Theatre Complex at Frere Hospital from 2018-2022. Information was obtained from the Theatre Booking Book (used primarily among surgeons and anaesthetists) and the Theatre Register Book (used by theatre nursing staff).

**Results:** 342 paediatric neurosurgery theatre cases were completed across the 5-year period, of which 24,3% were emergencies. Neonatal cases comprised 15,8% and infants made up 45,3% of cases. Most patients were male (51,2%) compared to 40,4% female and 8,4% unknown. Ventriculoperitoneal shunt-related surgeries constituted the lion share of the cases, totalling 59,7%. 73 cases during this time could not be completed electively or emergently. Major causes of cancellation include unavailability of appropriate post-operative bed, staff shortages and insufficient time. Delayed arrival to theatre and prolonged time between theatre entry and initial incision contributed to time lost. There was a statistically insignificant drop in theatre case numbers during the Covid-19 pandemic (2020-2021).

**Conclusions:** This audit shines a light on the burden of paediatric neurosurgery in this part of the Eastern Cape in South Africa, and is a new foundation for future research. This data identifies ways to improve and optimise the provision of this necessary surgical service.

## Paediatric

Oral presentation

### Seizure control and functional outcome of pediatric hemisferotomy in 38 cases

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**Objectives:** The aim of the retrospective study was to correlate the clinical outcome in 38 pediatric hemisferotomies in 3 parameters pre and postoperatively. We analysed the data of seizure control, neurological impairment and cognitive outcome.

**Background:** Hemisferotomy results in favorable seizure outcome in 70 to 80% in majority of studies. Beside this benefit we observe postoperative impairment as neurological deficit and activity limitations. These factors are generally accepted, but less tolerated in group of patients with minimal neurological deficit preoperatively.

**Methods:** We analysed the data of seizure control, neurological impairment and cognitive outcome, using techniques appropriate to their mental abilities (Bayley Developmental Scales, Wechsler Intelligence Scales for Children). Thirty-five patients were comprehensively processed; 3 had to be excluded due to incomplete data.

**Results:** Patients of age from 4 months to 15 years, (average 5,1 y). F:M ratio 1:1. We had no mortality, 11 (28,9%) complications, 6 minor (15,7%) and 5 major (13,2%). Operation was in 24 cases on the right and in 14 on the left hemisphere. 32 patients were seizure free Engel I, five patients Engel II and one Engel III. Histology was classified as MCD in 18, encephalitis in 9, gliosis in 6 and other pathology in 6 cases. Preoperative hemiparesis remained unchanged or improved in 2 years follow up in 27 (71%). In 35 patients we observed significant improvement (more than 8 IQ points) in 8 patients (22,4%), significant deterioration in 4 patients (11,4%), in 19 (54%) cases we observed slight improvement and in 4 (11,4%) slight deterioration.

**Conclusions:** 34,2% of patients are children with intellectual performance within the norm (IQ higher than 70), the rest are children with disorder of intellectual development, 37,1% of them with severe or profound performance. 88,6% patients in the study group demonstrated the same or higher cognitive level postoperatively.



## Functional

Oral presentation

MRI parameters as potential predictive factors in evaluation of patients with disorders of consciousness prior to DBS

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**Objectives:** The aim of the study was to investigate the clinical application of MRI morphometric analysis and imaging indicators of diffusion tensor imaging (DTI) for the DOC patients.

**Background:** Neuroimaging progress has yielded new tools which, potentially, can be applied to improve the diagnosis of neurological disorders and predict outcome. The disorders of consciousness (DOC) is limited to subjective assessment and objective measurements of behavior, with an emerging role for neuroimaging techniques.

**Methods:** MRI with obtaining high resolution T1 MPRAGE and DWI was done in twenty patient with a clinical diagnosis of DOC admitted at Department of Neurosurgery Dubrava University Hospital in order to perform neurophysiological testing to confirm whether is the patient candidate for deep brain stimulation. Morphometric analysis was done using Freesurfer software. The data for the imaging indicators, fractional anisotropy (FA) and mean diffusivity (MD), were separately collected from three relevant regions of interest (ROIs): brainstem, thalamus, and subcortex.

**Results:** The indicators were statistically analyzed, and correlation analyses were conducted for the results of morphometric study and mean values of FA and MD in the ROIs evaluated through clinical Rappaport Disability Rating, Coma/Near Coma scale and Coma Recovery Scale-Revised scores. Morphometric analysis revealed that level of brain volume decrease is correlated with severity of DOC. Furthermore, the more severe the DOC, the higher the MD value and the lower the FA value. The FA and MD values in the ROIs correlated with CRS-R scores, particularly in the thalamus.

**Conclusions:** Both volumetric and DTI analysis has proved to be a powerful tool as it grants insight into the pathogenesis and specific grey and white matter abnormalities underlying different comatose states, casting light on the neural basis of consciousness and the clinical features associated with DOC.



## Functional

Oral presentation

Decreased hemispheric volume may be associated with occurrence of peri-lead edema in Parkinson disease patients with Deep Brain Stimulation

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**Objectives:** The aim of the study was to investigate whether decreased brain hemispheric volume is associated with occurrence of PLE in Parkinson Disease (PD) patients after DBS implantation in subthalamic nuclei (STN).

**Background:** Postoperative peri-lead edema (PLE) is a poorly understood complication of deep brain stimulation (DBS), which has been described sporadically in patients presenting with profound and often delayed symptoms.

**Methods:** This retrospective study included 130 PD patients underwent STN DBS at the Department of Neurosurgery, Dubrava University Hospital in period 2008-2023 year. Magnetic resonance imaging (MRI) sequences were used, preoperative high resolution T1 MPRAGE for volumetric analysis using Freesurfer software, and postoperative T2 images to determine occurrence of PLE, inspected independently by two researchers.

**Results:** PLE was detected either unilaterally or bilaterally. Mild to moderate association was established between decreased volume of brain hemisphere and occurrence of PLE. In addition, tissue/cerebrospinal fluid ratio presented mild association with occurrence of PLE. Interestingly, in these patients cardiovascular comorbidities were reported previously.

**Conclusions:** Peri-electrode edema is a common, transient reaction to DBS lead placement, and patients can present with severe symptoms or can be asymptomatic and go undiagnosed. Since no clear risk factors have been identified, further studies are needed.

## Education, Ethics, Socioeconomic

ePoster presentation

A liberal approach to infection surveillance in a neurosurgical intensive care unit - an audit of 200 patients

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**Objectives:** Review the approach to diagnosis of infection in a neurosurgical intensive care unit (NICU).

**Background:** NICU patients have complex challenges with infectious diseases, including difficult-to-diagnose central nervous system infections and healthcare-acquired infections in post-neurosurgical patients. Our NICU infection surveillance protocol recommends pan-culture and blood procalcitonin (PCT) determination for the following trigger events: systolic hypotension (<90 mmHg unresponsive to fluid loading), body temperature (>38°C), or white blood cell count (>13,000/ $\mu$ L).

**Methods:** An audit comprising of 200 patients to a single NICU from May to December 2022. Data collection included demographics, diagnoses, initial blood cultures, date of diagnosis, mortality rates, PCT, tracheal aspirates (TA), urine(UC) and blood cultures (BC), and organism sensitivities.

**Results:** Of 200 patients, 153 were not cultured (GroupNC) since they did not display any protocol triggers. GroupNC consisted of 108 males and 45 females. The mean age was  $39 \pm 17$  years. The remaining 47 patients, 34 males and 13 females with age  $43 \pm 15$  years (mean  $\pm$  1SD) met protocol criteria for culture analysis and PCT determination (GroupC).

A total of 50 infections(20 bloodstream, 17 respiratory tract and 13 urinary tract) were identified in 34 of the 47 patients belonging to GroupC. Of the 50 infections, 29 (58%) were identified by Day 7 of NICU admission. PCT blood levels of GroupC patients ranged from 0.08 to 88.6 (mcmol/L) with Klebsiella Pneumonia most commonly cultured organism. Mortality rates were 8% for the GroupNC, 42% for those with positive blood cultures which is statistically significant (  $p < 0.001$ ).

**Conclusions:** These findings emphasize the significance of early and accurate sepsis diagnosis in NICU patients. The high mortality rate associated with positive blood cultures highlights the severity of bloodstream infections in this population. This data contributes our understanding of infectious disease challenges in neuro-intensive care, guiding the refinement of protocols and interventions to improve patient outcomes.

## Functional

ePoster presentation

### Deep Brain Stimulation and structural brain MRI changes in Parkinsons disease – preliminary study

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**Objectives:** The aim of this study is to determine the structural changes caused by DBS in patients with PD using volumetric and tractographic analysis of magnetic resonance imaging (MRI).

**Background:** Deep Brain Stimulation (DBS) is established as effective therapy for advanced Parkinson's disease (PD). Despite significant symptom improvements with the use of DBS, the exact mechanism of DBS functioning as well as its effect on the central nervous system remains unknown. Furthermore, many issues are unresolved; what is the mechanism of DBS in PD, does DBS induce structural changes in basal ganglia due to stimulation or is it possible to quantify the reorganization of brain structures in PD patients?

**Methods:** In this study 10 patients with PD will perform preoperative and postoperative MRIs, which will, with the use of computer programs for volumetric analysis alongside tractographic analysis, provide insight into DBS effect on CNS structures. Ten PD patients underwent bilateral STN DBS electrode implantation. Brain MRI scans were done prior to the procedure, in a week after the procedure, and approximately two years after the electrode implementation. In depth and detailed volumetric analysis was done using automated, observer independent volumetric software, while tractographic analysis was done using TrackVis program.

**Results:** Structural changes have been showed using volumetric analysis at third measuring point, while tractographic parameters also showed altered data in both second and third measuring point.

**Conclusions:** The result of this study enables a better understanding of DBS activity in PD patients and provide data on potential structural brain changes in patients with PD and to provide a good starting point for further research.

## Trauma

ePoster presentation

### When the brain spits the bone: the case for planned surgical delay in some patients with cranial gunshot wounds

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**Objectives:** To describe a common but previously not characterized phenomenon: spontaneous superficial migration of deep intraparenchymal bone fragments. Additionally, to make the case that, in well-selected patients, a planned delay in surgical debridement can be advantageous, allowing the successful removal of bone fragments initially deemed too deep to remove.

**Background:** Early surgical debridement is generally advocated for the majority of patients with gunshot wounds (GSW) to the head. Goals of surgery typically include cerebral decompression, hematoma evacuation, removal of accessible metallic and bone fragments, and restoration of a watertight dural barrier.

**Methods:** Two case reports and literature review.

**Results:** We report 2 patients, both young men in their 20's and 30's, with GSW to the head and deep, inaccessible intraparenchymal bone fragments. In both patients, an unplanned 2 to 3-day delay in surgical debridement allowed spontaneous superficial migration of bone fragments, thereby allowing gross total removal in one patient and subtotal removal in the other. Both patients initially presented with relatively mild injuries, largely due to the nearly tangential bullet trajectory relative to the skull. As a result, none of the 2 patients required emergency surgical decompression, making this surgical delay possible. Moreover, in both patients, intraparenchymal foreign bodies were predominantly bony in nature, with little or no metallic fragments in the brain. Both patients had uneventful postoperative courses and experienced favorable recoveries.

**Conclusions:** In well-selected patients with mild GSW injuries to the head and deep intraparenchymal bone fragments, a planned 2 or 3-day delay in surgical debridement may be a reasonable option. Provided the risk of infection is mitigated by early scalp closure and the judicious use of antibiotic prophylaxis, this surgical delay may allow time for the brain to expel bone fragments, thereby facilitating their safe removal.

## Functional

Oral presentation

Optimal targets, connectivity, and tissue integrity for deep brain stimulation in patients with disorders of consciousness

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**Objectives:** To determine whether DBS outcomes in DOC are associated with stimulation locations, connectivity of stimulation sites, and MRI measures of brain tissue integrity.

**Background:** Disorders of consciousness (DOC) are characterized by alterations in arousal and/or awareness resulting from brain injuries. Deep brain stimulation (DBS) is an emerging treatment to restore arousal/awareness in DOC. However, little is known about optimal targets and whether outcomes depend on brain connectivity, tissue integrity, or reorganization potential.

**Methods:** Retrospective analysis of 38 patients with DOC who underwent unilateral DBS targeting thalamic centromedian nucleus (ages=12-65 years). DOC resulted from anoxic ( $n=26$ ) or traumatic ( $n=12$ ) injuries. Patients were classified as 'responders' or 'non-responders' using Coma/Near Coma and Coma Recovery Scales. Volumes of tissue activated (VTAs) assessed DBS locations associated with favorable response. Correlations were also performed with age, regional brain volumes from pre-operative MRI, and structural connectivity calculated from patients' VTAs using normative diffusion MRI.

**Results:** 8/38 patients were responders and 24/38 non-responders; outcomes are pending in 6/38 patients due to <3 months follow-up. Favorable response was associated with younger age (median age=19 years in responders, 42 years in non-responders) and greater volumes of whole-brain grey matter and subcortical regions including putamen, pallidum, caudate, and cerebellum. Responders also tended to have deeper and more medial implantations, with VTAs engaging parafascicular nucleus, reticular nucleus, and peri-midbrain red nucleus. In responders, VTA connectivity was higher with superior frontal gyrus, caudate, pallidum, and cerebellum, and lower with sensorimotor and occipital cortex.

**Conclusions:** Efficacious DBS for DOC is linked to younger age, greater preservation of whole-brain grey-matter, greater volumes of and connectivity with select subcortical areas (pallidum, caudate, cerebellum), stronger connectivity with superior frontal gyrus, and stimulation of locations inferomedial to the centromedian nucleus. Findings may assist with optimizing patient selection, DBS targeting, and post-implantation programming.

## Hydrocephalus

Oral presentation

The flexible neuroendoscope: versatility in hydrocephalus and arachnoid cysts with video presentations

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**Objectives:** 1. To compare the flexible to rigid neuroendoscopy and different applications in hydrocephalus and arachnoid cysts.

2. To present various pathologies treated with flexible scope using video presentations.

3. treatment of arachnoid cysts endoscopically.

**Background:** The flexible neuro endoscope has developed over recent years in terms of optics and use popularised especially in ETV,CPC and various other application.

We demonstate various cases treated with case presentations.

**Methods:** The use of the Flexible scope has been used at the Moi Teaching Referral Hospital in Eldoret Kenya. All the patients are below 12 years. Patients were selected with arachnoid cysts.

**Results:** The flexible endoscope demonstrated superior results in achieving greater depths and opening of arachnoid cysts and in ETV and the percent coagulation in CPC (choroid plexus coagulation) is also superior. Other pathologies like aquedoplasty, septostomy, biopsy, fenestation of arachnoid cysts are well demonstrated.

**Conclusions:** The Flexible neuro endoscope has a wide range of applications and is essential for the neuro surgeon to adopt its use in management of various pathologies.

## Trauma

Oral presentation

Emergency decompressive surgery in patients with brain herniation and pupillary abnormalities: importance of improved pupillary response after osmotherapy and surgery

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**Objectives:** To present the predictors of survival and functional recovery following emergency decompressive surgery in the setting of transtentorial brain herniation.

**Background:** The predictors of survival and functional recovery following emergency decompressive surgery in patients with transtentorial brain herniation, particularly those with pupillary abnormalities, have not been established.

**Methods:** Retrospective chart review of all patients with transtentorial herniation and pupillary abnormalities who underwent craniotomy or craniectomy at two trauma/stroke centers between 2016 and 2022. Functional outcome was determined using modified Rankin Scale (mRS).

**Results:** Forty-three patients, 34 men and 9 women with mean age 47 years (range 16-92), were included. Underlying etiology was: traumatic brain injury in 33, hemorrhagic stroke in 8, tumor in 2. Median preoperative Glasgow coma score was 3 (range 3-8) and midline shift 9 mm (range 1-29). Thirty-two patients (74.4%) had bilaterally fixed and dilated pupils. Median time to surgery (from pupillary changes) was 133 minutes (mean 169, range 30-900). Eighteen patients (41.9%) died postoperatively. After a median follow-up of 12 months (range 3-12), 11 patients (26.8%) had favorable functional outcome, while 10 remained severely disabled (mRS 5). On univariate analysis, younger age ( $p < 0.001$ ), midline shift ( $p = 0.049$ ) and improved pupillary response after osmotic therapy ( $p < 0.01$ ) or decompressive surgery ( $p < 0.001$ ) were associated with favorable outcomes at 3 months.

**Conclusions:** With aggressive medical and surgical management, patients with transtentorial brain herniation, including those with bilaterally fixed and dilated pupils, may have considerable rates of survival and functional recovery. Young age, less midline shift, and improved pupillary response following osmotic therapy or decompressive surgery are favorable prognosticators.

## Neurovascular Surgery

ePoster presentation

Traumatic avulsion of a foramen magnum dural arteriovenous fistula: an exceptional cause of subdural-subarachnoid-medullary hemorrhage

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**Objectives:** To report a unique case of traumatic avulsion of the draining vein of a dural arteriovenous fistula (DAVF).

**Background:** Traumatic avulsion of a DAVF as a cause of massive intracranial hemorrhage (ICH) has not been previously reported.

**Methods:** Case report and literature review.

**Results:** A previously healthy 42-year old man suffered sudden collapse with cardiorespiratory arrest following an assault. Following successful cardiopulmonary resuscitation, head CT revealed massive subdural and subarachnoid hemorrhage at the craniocervical junction with medullary and fourth ventricular hemorrhage. CTA of the head and neck was unremarkable. Following a brief initial state of coma, the patient exhibited gradual neurologic improvement, but remained ventilator-dependent with poor respiratory drive. Cerebral and cervical spinal angiography demonstrated a 1.5-mm pseudoaneurysm of a distal dural branch of the right posterior inferior cerebellar artery (PICA) in the region of the foramen magnum. The patient underwent microsurgical exploration via a midline suboccipital craniotomy, where active dural arterial bleeding in the subdural and subarachnoid spaces was encountered, arising from the right lateral foramen magnum dura and adjacent to an avulsed draining vein directed toward the upper cervical spinal cord. The hemorrhagic dura was directly fed by a small distal dural branch of the right PICA. Those findings were consistent with a traumatically avulsed DAVF of the foramen magnum. After the feeding artery was coagulated and divided, active dural bleeding was controlled with bipolar coagulation, resulting in stable hemostasis. Postoperative cerebral angiography confirmed complete obliteration of the pseudoaneurysm with no residual DAVF. The patient had an uneventful postoperative course and was ultimately discharged to a nursing facility, while remaining ventilator-dependent.

**Conclusions:** Though exceedingly rare, traumatic avulsion of the draining vein in a DAVF may lead to massive ICH at arterial pressures. Even in the setting of a convincing traumatic mechanism, atypical ICH should be always investigated with catheter angiography.



## Global Neurosurgery

Oral presentation

Self-reporting neurosurgical workforce and gaps in Portuguese speaking African Countries: a survey by association of African Portuguese-speaking neurosurgeons (A.N.PALOP)

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**Objectives:** Our study aim is to present the current neurosurgical capacity within the Portuguese speaking African countries, understanding its frailty, limitations, challenges and future necessities for improvement.

**Background:** Neurosurgical capacity building has been a topic worldwide within LMICs. Africa is on the rise to become an equal contributonal partner in promoting health equity through capacity building within the continent. Input from Portuguese-speaking African countries seems to be lagging. The association of African Portuguese-speaking neurosurgeons (ANPALOP) has been founded in 2023 to promote visibility, advocacy and improve neurosurgical structures.

**Methods:** A combined qualitative and quantitative survey through Microsoft Forms, was sent to neurosurgeons from PALOP countries: Cape Verde, Angola, Mozambique, Guinea Bissau, Equatorial Guinea.

**Results:**

22 of 39 (56%) neurosurgeons responded to the survey. 95% of neurosurgeons were <45 years of age and 86,4% had <5 years neurosurgical experience and 72,7% consider themselves general surgeons. 31,8% are currently fellows outside of Africa. 87,5% of that group wants to return to Africa (Cape Verde, Guinea Bissau, Angola) after their fellowship due to patriotism, family and future opportunities in Africa. Challenges seem to be: lack of resources (100%), organizational systems (50%), delayed referral times (41,7%), uninsured (33,3%) and mistrusting (33.3%) patients. No neurosurgery in Guinea Bissau or São Tomé & Príncipe. See Table 1: neurosurgeons per capita.

Country	Population	Risk of catastrophic expenditure if surgery is required	social insurance coverage	Neurosurgeons (local/expats)	Neurosurgeon per capita	Neurosurgical centers	Neurosurgical residency programs	MRI	CT
Angola	34,503,774	49%	4% (2018)	18,8/12	1:1,120,252	<10	3-5	X	
Cape Verde	587,925	16%	6% (2007)	1/3	1:146,981	<5	0		X
Guinea Bissau	2,060,721	81%		0		0	0		
Equatorial Guinea	1,634,466			1/2	1:544,822	<5	0		X
Mozambique	32,077,072	23%		12,3/4,8	1:1,875,852	<5	1-2	x	x
São Tomé e Príncipe	223,107		4% (2014)	0		0	0		

**Conclusions:** The PALOP neurosurgical workforce is insufficient and needs immediate strengthening. Implementation, uniformity, and structure of high-quality specialized neurosurgical education is imperative to promote capacity. Attention needs to be given to the lack of resources, imaging modalities and poor organization of neurosurgical care within the hospitals but also countries.

To our knowledge, this is the first joined effort between the PALOP countries into understanding our current frail neurosurgical workforce and immediate action is needed to close the gap on health disparities.

## Skull Base

ePoster presentation

### Tension pneumoventricle: systematic review of a rare, potentially lethal neurosurgical complication

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**Objectives:** To study the clinical features, optimal management, and outcome of tension pneumoventricle (TP).

**Background:** TP is a rare, yet potentially lethal complication of cranial or transsphenoidal surgery and trauma. Given its rarity, literature on TP is scarce, consisting largely of case reports.

**Methods:** A systematic review of Medline, Embase, and Scopus databases was undertaken using the PRISMA methodology. Individual patient data was extracted, tabulated, pooled, and analyzed.

**Results:** Of 3,494 papers screened, 46 studies (N=58) were retained. There were 45 case reports (n=46) and 1 retrospective series (n=12) reporting on 35 men and 23 women with mean age 44 years (range 0-79). Underlying etiologies were: postoperative in 43 (craniotomy: 22, ventricular drain/shunt: 12, transsphenoidal/endoscopic: 9), of which 23 (53.5%) involved disruption of the ventricular system, traumatic in 10, 9 of which (90%) involved the skull base, tumor eroding the skull base in 3, and congenital skull base defect in 2. Overall, two-third of patients (n=37, 63.8%) had direct involvement of basal cisterns and/or ventricles. Time to presentation varied widely (0-180 days, median 7). Two-third of patients had altered mentation (62.1%), one-third symptoms/signs of elevated intracranial pressure (36.2%), and one-third focal neurologic deficits (31%). Most patients (n=42, 72.4%) underwent emergency ventriculostomy to decompress the ventricles, while 20 (34.5%) had surgical repair of the underlying defect. Five patients (8.6%) died. Of 53 survivors, the vast majority (n=49, 92.5%) had resolution of TP, while 3 (5.7%) experienced a recurrence.

**Conclusions:** Though rare, TP is potentially fatal and should be given consideration whenever acute neurologic deterioration occurs after surgery on the ventricles and after traumatic or non-traumatic disruption of the skull base. Early identification and timely management of this complication yields favorable outcomes with low recurrence rates.

## Global Neurosurgery

Oral presentation

Impact of the COVID-19 pandemic on stroke care quantified: the Bronx experience

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**Objectives:** To quantify disruptions in stroke diagnosis and treatment during the NYC COVID-19 surge (March-April 2020) relative to presurge (January-February 2020) and postsurge (May-June 2020) periods.

**Background:** It is widely reported that the COVID-19 pandemic has had a profound negative impact on the quality of stroke care.

**Methods:** Retrospective cohort study at a primary stroke center serving one of the hardest hit communities in the nation. All stroke patients managed between January and June 2020 were included.

**Results:** During the study period, 149 strokes were managed at our center: 62 in the presurge, 46 during the surge, and 41 in the postsurge. Median NIHSS score (2-6-4,  $p=0.24$ ) and the proportion of hemorrhagic strokes (16.1%-15.2%-17.1%,  $p=0.97$ ) did not differ significantly among the 3 periods. Mean time to presentation from last known normal also did not differ significantly, although there was a trend toward earlier presentation during the surge (14.3h-5.4h-14.5h,  $p=0.09$ ). Likewise, the rates of large vessel occlusion (8.1%-13%-7.3%,  $p=0.6$ ) and referral for intra-arterial therapy (6.5%-8.7%-7.3%,  $p=0.91$ ) were similar. In contrast, during the surge, there were sharp reductions in the use of MRI (58.1%-26.1%-43.9%,  $p<0.01$ ), MRA/CTA (88.7%-69.6%-65.9%,  $p=0.01$ ), transthoracic echocardiography (72.6%-45.7%-61%,  $p=0.02$ ), transesophageal echocardiography (9.7%-2.2%-0%,  $p=0.05$ ), and Holter monitoring (48.4%-21.7%-31.7%,  $p=0.01$ ). Conversely, there were no statistically significant differences in the rates of carotid ultrasonography, loop recorder placement, electrocardiography, and routine laboratory testing. Expectedly, there were sharp increases in ESR (9.7%-41.3%-17.1%,  $p<0.0001$ ), CRP (4.8%-39.1%-49.8%,  $p<0.0001$ ), and D-dimer (1.6%-39.1%-12.2%,  $p<0.0001$ ) testing in the surge and postsurge periods.

**Conclusions:** The COVID-19 pandemic was associated with significant disruptions in stroke care, especially stroke workup, which started during the surge and persisted in the early postsurge period.

## Oncology

ePoster presentation

### Left temporal intraparenchymal schwannoma: a bilingual awake craniotomy approach

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**Objectives:** Herein is presented a case report of a very rare entity, an intraparenchymal schwannoma.

**Background:** Schwannomas are benign lesion originating from peripheral nerve sheath cells. 8% of all brain tumours are intracranial schwannomas, being 80 to 90% associated with the vestibular nerve. Intraparenchymal schwannomas are even less frequent, accounting for <1% of all intracranial schwannomas. Some suggest these tumours arise from ectopic Schwann cells derived from the neural crest.

**Methods:** This study retrospectively analyses the clinical records of a patient admitted in February 2023. Evidence research was conducted using PubMed®.

**Results:** A 37-year-old bilingual Russian woman presented with a 6-month history of headache and nausea, associated with sporadic paraphasias. No previous medical history or medication was reported. During clinical evaluation, the patient presented fully oriented and cooperative, had fluent speech, and no focal deficit. MRI revealed a left temporal intra-axial cystic lesion with a nodular component with contrast enhancement. The patient was admitted for elective surgery. An awake craniotomy with bilingual, Russian and Portuguese, Penfield language mapping was performed. Complete *en bloc* removal of the cystic lesion was performed with no language deficits encountered. The patient showed full recovery and had early discharge. Post-operative MRI confirmed total resection. Pathology results were compatible with schwannoma, grade 1. At 2-month post-operative examination, the patient showed no neurological deficits and had resumed her daily life.



**Conclusions:** Intraparenchymal Schwannomas carry a good prognosis and complete resection is the standard treatment. It is crucial to report and improve recognition of this entity in order to deepen our understanding of its origin and pathophysiology.

## Trauma

ePoster presentation

### Spinal gunshot injuries in a conflict area of the DRC: the challenges of care

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**Objectives:** Describe the epidemiological, clinical aspects and the therapeutic challenges of spinal gunshot injuries in DRC.

**Background:**

Gunshot Spinal traumas are increasingly common, especially in areas of armed conflict, and concern both soldiers and civilians. Young populations are the most exposed to spinal injuries. The management is a challenge because of the high infectious risk.

**Methods:**

We presents a retrospective study of 30 patients admitted for spinal trauma by bullet in the neurosurgery department of the HPGRB/DRC over a period of 7 years in 2022. We recalled our data from the medical files of the patients treated for spinal gunshot injuries in the surgical department during the study period.

**Results:**

The prevalence of spinal gunshot injuries was 21.2% (51/241 gunshot injuries). 30 patients were selected, 27 were male (sex ratio: 1F/9M). 56.7% of trauma were victims of aggression, 66.7% came from rural areas. 76.7% of our patients were civilians and 23.3% of them were traders. Paraplegia was the main lesion. The dorsal and the lumbar spine injuries were predominant with respectively 40% and 33.3%. Penetrating wounds were the most found (63,3%). The spinal contusion were mainly found (26.7%), compression (23.3%) and section (16.7%). 70% of our patients required surgical treatment within 48 hours of admission, which consisted on surgical debridement (100% of cases) followed by decompressive laminectomy (80% of cases). Medical treatment consisting of antibioprohylaxis, tetanus prophylaxis and corticosteroids was required in several cases. In the follow up, 40% of patients developed a decubitus complications with an average hospital stay of 74.5 +/- 21.2 days. 76.7% of patients benefited of physiotherapy.

**Conclusions:**

The management of VMT includes medical treatment based on conditioning the patient, antibiotherapy, tetanus prophylaxis and sometimes corticosteroids. Surgical treatment depends on the type of lesion and the degree of damage assessed from the ASIA score. Physiotherapy is a systematic care.



## Global Neurosurgery

Oral presentation

The COVID-19-stroke connection revisited: an in-depth analysis from the frontlines in The Bronx, NY

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**Objectives:** To analyze the characteristics of stroke in COVID-19 versus COVID-19-negative patients.

**Background:** Strokes have been reported in patients with wild-type COVID-19. It remains unclear whether stroke characteristics in those patients differ from the general population.

**Methods:** Retrospective cohort study at a primary stroke center serving one of the hardest hit communities in the nation. All stroke patients managed between January and June 2020 were included.

**Results:** 1,242 patients with COVID-19 and 149 with stroke were treated. Fifteen strokes, 10 ischemic and 5 hemorrhagic, occurred in COVID-19 patients, yielding a 1.2% stroke rate. Of those, 13 occurred during the surge (March-April 2020), representing 28.3% of all strokes at that time. Stroke occurred during hospitalization for COVID-19 in 8 patients, 7 with critical or severe disease. The remaining 7 patients, only 1 with severe disease, presented initially with stroke symptoms. Overall, the COVID-19 cohort consisted of 8 women and 7 men with mean age 62 years (range 32-84) and median NIHSS 13 (0-30). Only 1 (6.7%) large vessel occlusion occurred in this group. Thirteen patients (86.7%) had at least 1 cardiovascular risk factor. Per TOAST criteria, ischemic stroke mechanisms were: cardioembolic in 3 (30%), small vessel in 1 (10%), and undetermined in 6 (60%). Seven patients died, while 3 had favorable functional outcome (mRS 0-2) at discharge. Compared with 134 contemporaneous COVID-19-negative stroke patients, COVID-19 patients had higher NIHSS scores (median 13 vs. 4,  $p=0.001$ ), higher mortality (46.7% vs. 5.1%,  $p=0.0001$ ), lower likelihood of favorable outcome (20% vs. 63.3%,  $p<0.01$ ), and trend toward a higher rate of hemorrhagic stroke (33.3% vs. 14.2%,  $p=0.07$ ).

**Conclusions:** Stroke affects around 1% of COVID-19 patients in the hospital setting. Compared with the general population, COVID-19 patients have higher NIHSS scores and worse outcomes, likely reflecting a combination of increased stroke severity, higher rates of hemorrhage, septic/hypoxemic encephalopathy, and systemic disease.



## Hydrocephalus

ePoster presentation

The outcomes of endoscopic third ventriculostomy and ventriculoperitoneal shunt in the management of paediatric hydrocephalus: a systematic review and meta-analysis

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**Objectives:** To evaluate the outcomes of endoscopic third ventriculostomy (ETV) and ventriculoperitoneal shunt (VPS) in the treatment of paediatric hydrocephalus.

**Background:** There is a paucity in research based evidence on the outcomes of ETV and VPS as a treatment of choice for paediatric hydrocephalus.

**Methods:** PubMed, Medline, and Cochrane Central Register of Controlled Trials databases were searched, and articles published from 2000 to May 2023 were included (last search date May 6, 2023). The searched keywords included: endoscopic third ventriculostomy, ventriculoperitoneal shunting, paediatric population and outcomes. Success rates and complications of both ETV and VPS were compared utilising random-effects models. The primary outcome was comparing the success rate between ETV and VPS and the secondary outcome measured were the occurrence of complications post treatment. Studies reporting on outcome measures such as treatment success, complication rates, and revision rates were included.

**Results:** Of 126 articles identified 11 RCTs were included in the final analysis. Only 5 studies had relevant information for the primary outcome (746 patients identified: 429 in ETV group, 317 in VPS group). Mean age was: . Combined success rates were 81.8% ( $n = 283/346$ ) in the ETV group and 86.7% ( $n = 182/210$ ) in the VPS group (median follow-up 41 months). There was no difference in success rates between ETV and VPS groups (odds ratio 0.94, 95% confidence interval 0.86–1.03,  $P = 0\%$ ). Combined complication rates were 4.6% ( $n = 16/346$ ) in the ETV group and 27.1% ( $n = 57/210$ ) in the VPS group. ETV had a lower rate of [postoperative complications](#) (odds ratio 0.22, 95% confidence interval 0.11–0.33,  $P = 0\%$ ).

**Conclusions:** Both, ETV and VPS are viable surgical options for the management of paediatric hydrocephalus with similar success rates when used as first-line treatment. However, our study concluded that VPS results in a higher complication rate.

## Global Neurosurgery

ePoster presentation

### Stroke rates, mechanisms, and clinical features during the COVID-19 pandemic: The Bronx experience

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**Objectives:** To analyze the rates, mechanisms, and clinical features of stroke during the NYC COVID-19 surge (March-April 2020), presurge (January-February 2020) and postsurge (May-June 2020) periods, and compare them with the historical control periods of March-April 2018 and 2019.

**Background:** It has been reported that the COVID-19 pandemic profoundly impacted stroke care in the U.S., including hospital case volume and stroke patient characteristics.

**Methods:** All COVID-19 patients who presented with a diagnosis of stroke between January and June 2020 were included. Charts were retrospectively reviewed and the following variables recorded: demographics, cardiovascular risk factors, clinical presentation, severity of COVID-19 disease, laboratory data, radiologic findings, mechanism of stroke, treatment, and outcome.

**Results:** During the study period, 1,242 COVID-19 patients and 148 (125 ischemic, 23 hemorrhagic) strokes were managed. During the pre-surge, there were 62 strokes (52 ischemic and 10 hemorrhagic), zero with COVID-19. Median age was 62 years (38-92), median NIHSS 2 (0-36), and mean number of cardiovascular risk factors was 3.5. During the surge, there were 46 strokes (40 ischemic and 6 hemorrhagic), 12 with COVID-19. Median age was 64 years (29-93), median NIHSS 6 (0-28), and mean number of cardiovascular risk factors was 3.4. During post-surge, there were 40 strokes (33 ischemic and 7 hemorrhagic), 2 with COVID-19. Median age was 58.5 (19.92), median NIHSS was 3.5 (0-30), and mean number of cardiovascular risk factors was 2.9. Stroke severity increased with ischemic and hemorrhagic proportions unchanged. Stroke characteristics in 2020 were non-different from March-April 2018 and 2019.

**Conclusions:** The clinical characteristics and pathophysiologic mechanisms of stroke during the pandemic seem to have generally remained in line with the pre-pandemic experience.

## Global Neurosurgery

ePoster presentation

Are young and middle-aged people, barely sick with COVID-19, dying of strokes? Insights from the frontlines in The Bronx, NY

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**Objectives:** To determine the rate of stroke among young and healthy patients with mild COVID-19.

**Background:** It has recently been claimed and widely publicized that young and healthy patients with only mild COVID-19 are developing strokes at an alarming rate. However, data supporting this claim is severely lacking. To help answer this question, we reviewed the experience at our primary stroke center, one of the major COVID-19 epicenters in the US.

**Methods:** All COVID-19 patients who presented between January-June 2020 with stroke were included. Charts were reviewed and demographics, cardiovascular risk factors, clinical presentation, severity of COVID-19 disease, laboratory data, radiologic findings, stroke mechanism, treatment, and outcomes were recorded.

**Results:** 149 strokes and 1,242 COVID-19 patients were managed identified. Only 7 COVID-19 patients, 4 women and 3 men, initially presented with stroke. There were 4 ischemic strokes and 3 hemorrhagic strokes with a median NIHSS of 9 (0-24). All 7 patients were older than 50 years (mean: 63 years, range: 56-84). Six patients (3 ischemic, 3 hemorrhagic) presented asymptomatic COVID-19 and all had risk factors for stroke: hypertension (n=4), diabetes mellitus (n=4), hyperlipidemia (n=2), atrial fibrillation (n=1), previous stroke (n=1). Only 1 had a large vessel occlusion. In another, intraparenchymal hemorrhage was later found to be caused by an underlying glioblastoma multiforme. The seventh patient presented with severe COVID-19 and altered mentation. His condition necessitated emergency transfer to another facility. Thus, cardiovascular risk factors were unknown. Two patients died during their stay, including 1 with ischemic stroke and 1 with hemorrhagic stroke. Of the 5 survivors, 3 had a favorable functional outcome (mRS 0-2) at 90 days, 1 had moderate disability (mRS 3), and 1 was lost to follow-up.

**Conclusions:** In this large cohort of patients with COVID-19, no young or middle-aged healthy patient suffered a stroke while presenting with mild or asymptomatic COVID-19 disease.

## Oncology

ePoster presentation

### Intraventricular meningiomas - a rare location

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**Objectives:** Intraventricular meningiomas (IVMs) are rare tumors compared with intracranial meningiomas. The optimal surgical management of IVMs is controversial. The aim of our work is to review the outcomes and complications of intraventricular meningiomas treated with various surgical approaches.

**Background:** Primary intraventricular meningiomas (IVMs) make up 0.5%-3% of all intracranial meningiomas and represent one of the most challenging lesions in neurosurgery. This study aims to share our experiences with a series of 5 patients with intraventricular meningiomas (IVMs).

**Methods:** We retrospectively reviewed 1869 brain tumors, and from this, 392 patients with intracranial meningioma were surgically treated between January 2010 and December 2022. This cohort identified 5 patients with intraventricular meningiomas (IVM) (1,27%). The clinical, radiologic, surgical, and follow-up records were analyzed.

**Results:** In our series, all 5 patients underwent microsurgical resection. The removal was performed by a posterior parietal approach in 4 lateral ventricle tumors and 1 temporoparietal approach, respectively. Preoperatively, patients commonly presented with headaches (80%), neurologic deficits (60%), and epilepsy (20%) in one patient. After surgical removal, symptoms were significantly reduced, including headache (preoperative 80% vs. postoperative 20%,  $P = 0.05$ ) and neurologic deficits (preoperative 60% vs. postoperative 0). Preoperatively, 2 patients experienced visual impairment, which was completely resolved after surgery. The Karnofsky performance scale was significantly improved after resection compared with before treatment (88 vs. 50,  $P = 0.05$ ). In 4 patients with World Health Organization was a grade I tumor, and grade II in one patient retrospectively.

**Conclusions:** Microsurgical treatment is the most suitable option, and total removal should represent the procedure's main goal. The posterior parietal transulcal and temporoparietal approaches are the most common surgical routes used in our series.

## Spine

Oral presentation

Revisiting the role of MRI in patients with stable traumatic cervical spine injuries on CT: is routine use warranted?

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**Objectives:** To assess the role of MRI in the management of traumatic cervical spine injuries that are otherwise deemed "stable" based on CT findings.

**Background:** Though MRI is often used indiscriminately in cervical spine trauma, it remains unclear whether its findings can impact the management or outcome of patients with injuries deemed "stable" on CT.

**Methods:** All adults with traumatic cervical-spine injury between 2015 and 2018, who underwent CT and MR imaging of the cervical-spine were included. Charts were retrospectively reviewed and demographic, clinical, radiologic, and outcome data were recorded. Specifically, the success or failure of conservative management was documented. MRIs were re-reviewed by an experienced neuroradiologist, their findings recorded, and discoligamentous injuries graded using the SLIC system. Outcomes of patients in whom MRI uncovered discoligamentous injuries were compared with those in whom MRI was noncontributory.

**Results:** Thirty-four patients, 19 men and 15 women with mean age 54 years (range 18-91). Mechanisms included fall (n=22), motor-vehicle accident (n=8), assault (n=3), unknown (n=1). CT showed fractures in 28 (82%): lateral mass/articular process (n=10), odontoid (n=7), vertebral body (n=5), lamina (n=5), pedicle (n=1). MRI revealed discoligamentous injuries in 23 (67%): interspinous ligament (n=14), supraspinous ligament (n=11), cruciate ligament (n=7), apical ligament (n=7), anterior atlantooccipital membrane (n=4), posterior atlantooccipital membrane (n=4). Only 3 patients had at least 1 grade-2 discoligamentous injury (disruption), while 20 had only grade-1 injuries. Four (11.8%) failed conservative management, 3 of whom underwent surgical stabilization. Failures occurred in all 3 MRI groups: grade-0 (1/11, 9.1%), grade-1 (2/20, 10%), grade-2 (1/3, 33.3%). Discoligamentous injury grade on MRI was not significantly associated with outcome.

**Conclusions:** With traumatic cervical-spine injuries deemed "stable" on CT and for whom conservative management is contemplated, MRI findings do not appear to impact outcomes. Thus, the routine use of MRI in this population may not be justified. Prospective studies are warranted.

## Spine

ePoster presentation

Implementation of an evidence-based infection prevention protocol for spinal fusion surgery: a single-institution, single-surgeon experience with zero surgical site infection

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**Objectives:** In 2018, an evidence-based clinical protocol for infection prevention after spinal fusion surgery was implemented in our center, including preoperative, intraoperative, and postoperative measures. In situ vancomycin was used in all posterior fusion procedures.

**Background:** Surgical site infections (SSIs) following instrumented spinal fusion are relatively common, with an incidence of nearly 3%.

**Methods:** All spinal fusion procedures performed by the senior author between January 2018 and December 2022 were identified from a prospectively maintained procedural database. Patients with a preexistent spinal infection were excluded. Medical records were retrospectively reviewed.

**Results:** During the study period, 163 spinal fusion surgeries in 133 patients were performed by the senior author. There were 97 men and 36 women with mean age 59 years (range 19-90). Indications for fusion were: degenerative disc disease in 66 (49.6%), traumatic fracture in 51 (38.3%), spinal tumor in 16 (12%). A posterior approach was used in 97 (occipitocervical:4, cervical:42, cervicothoracic:17, thoracic:10, thoracolumbar:10, lumbar:9, lumbosacral:3, thoracolumbosacral:2), with median number of levels fused of 4 (range 1-9). An anterior approach was used in 66 (cervical:63, cervicothoracic:3), with median number of levels fused of 2 (range 1-4). Median surgical time (skin incision-closure) was 195 minutes (mean 213, range 76-568). A closed suction drain was placed in 133 cases (81.6%), with a median length of stay of 2 days (range 1-7). All patients received perioperative antibiotics for 24 hours. After a mean follow-up of 12 months (median 6, range 1-52), not a single SSI occurred in this series. However, in one patient (0.6%), an esophageal injury occurred during anterior cervical fusion, resulting in a neck abscess, necessitating surgical drainage.

**Conclusions:** Using a pragmatic, evidence-based infection prevention protocol, the rate of SSI after spinal fusion surgery can be effectively reduced to zero.

## Trauma

ePoster presentation

### Skull reconstruction using a custom-made, three-dimensional-printed, hydroxyapatite-titanium cranioplasty implant: largest single-center U.S. experience

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**Objectives:** To present the single-center outcomes of a synthetic hydroxyapatite-titanium implant in cranioplasty.

**Background:** Although several material options are available for cranioplasty, implant-related complications have remained high. A relatively novel, synthetic hydroxyapatite-titanium implant, which combines biocompatibility with biomechanical resilience, has been reported to reduce tissue inflammation, infection, and explantation rates, while delivering superior cosmetic results. Clinical data supporting its use have remained scarce.

**Methods:** All the patients who had undergone cranioplasty between 2019 and 2022 using this implant were identified from a prospectively maintained database. Medical records were retrospectively reviewed and the following variables recorded: demographic data, clinical data, radiologic findings, operative details, complications (implant-related and unrelated), and outcomes.

**Results:** A total of 18 patients (12 men and 6 women), with a mean age of 39 years (range, 20-70 years), were identified. The indications for craniectomy were traumatic brain injury (n = 13; 72.2%), hemorrhagic stroke (n = 3; 16.7%), and ischemic stroke (n = 2; 11.1%). The median time to cranioplasty was 140 days (range, 51-1717 days). The median modified Rankin scale score before cranioplasty was 4 (range, 0-5). Cranioplasty was technically successful in all 18 patients. Minor postoperative complications, none related to the implant, were managed conservatively in 3 patients (16.6%), including a small intraparenchymal hematoma in 1, an extra-axial hematoma in 1, and a seizure in 1. Of these 3 patients, 1 (5.6%) died 1 week later of a suspected pulmonary embolism. No implant-related complications occurred after a median follow-up of 6 months (range, 1-38 months). All 17 survivors exhibited some degree of neurologic improvement. The cosmetic result was good or excellent for all patients.

**Conclusions:** Our experience, the largest in the United States, confirms the previously reported benefits associated with the use of 3-dimensional-printed hydroxyapatite-titanium cranioplasty implants.

## Oncology

ePoster presentation

### Third ventricle tumors: our 10 year experience

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**Objectives:** The aim of the current study was to analyze the results of third ventricle tumors surgery, depending on the lesion location and its degree of differentiation.

**Background:** A variety of tumors can occur in the third ventricle. A vast majority of them are histologically benign and potentially curable after surgical resection. Considering the slow growth of these tumors the lesions remain clinically asymptomatic until they reach significant size, which makes surgical removal technically difficult.

**Methods:** A retrospective analysis of 98 consecutive surgical interventions on third ventricle tumors that were treated at the Uzhhorod Regional Clinical Center of Neurosurgery and Neurology in the period from January 2012 to April 2022. Localization of tumors was as follows: anterior third ventricle in 66 cases, posterior third ventricle/pineal in 32 cases.

**Results:** Among the third ventricle tumours 74% were extending into the ventricle and only 26% were purely intraventricular. WHO Grade I-II tumours comprised 74%.

WHO Grade I-II tumour types are predominantly located in the anterior third ventricle, with craniopharyngioma being the most common histological tumour type. Surgical removal was the preferred tactics, with anterior transcallosal approach being the most common.

More malignant tumour predominance was witnessed in the posterior third ventricle, with pineoblastoma as the most common histological type. Transventricular endoscopic techniques are more being more and more often used in our series of patients, yet the microsurgical supracerebellar infratentorial approach is yet the most common surgical approach in our series.

**Conclusions:** Third ventricle tumour are still considered to be one of the most challenging for a neurosurgeon. We must consider the location of the tumour in the anterior or posterior third ventricle since it often dictates our surgical tactics and aggressiveness, with endoscopic transventricular techniques as a rising favourable option in many posterior third ventricle cases.



## Functional

Oral presentation

Defining the location of stimulation hot spot of the motor subthalamic nucleus in akinetic and tremor dominant Parkinson's disease

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**Objectives:** In our study we examined which STN subregion stimulation has better effect (hot spot) in akinetic dominant (AD) and tremor dominant (TD) PD patients.

**Background:** Deep brain stimulation (DBS) is an effective treatment of Parkinson's disease (PD). During the surgery, electrodes are implanted to the motor part of the subthalamic nucleus (STN). The motor STN has two subregions: 1. connected to the supplementary motor area (SMA-STN) and 2. connected to the primary motor area (M1-STN).

**Methods:** 7 AD and 7 TD PD patients who underwent DBS surgery were enrolled to our study. Pre-operative structural and diffusion MRI was done to localize the motor STN. Postoperative CT scans were used to visualize the electrodes. In every patient the active contacts were defined and a globe according to the stimulation amplitude was generated around it. The globes were transferred to standard MRI space and summarized. The SMA-STN and M1-STN were segmented by probabilistic tractography.

**Results:** The biggest overlap was 4 and 3 (right and left side) both in AD and TD patients and were considered as the hot spot. The hot spot was located in the SMA-STN of AD and in the M1-STN of TD patients.

**Conclusions:** Better therapeutic effect is achieved in AD and TD PD patients if different subregions of the motor STN are stimulated. These results can be used for surgical planning in DBS and raises the possibility of different neurophysiological mechanisms between the two phenotypes.

## Education, Ethics, Socioeconomic

ePoster presentation

Neurosurgery during a public health crisis: seven lessons learned from the COVID-19 pandemic

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**Objectives:** To share our lessons from the COVID-19 pandemic.

**Background:** During the recent COVID-19 pandemic, massive disruptions of neurosurgical care occurred across the globe.

**Methods:** A critical analysis of neurosurgical care, with special emphasis on neurotrauma and stroke, at one of the hardest hit hospitals in a major epicenter of the first wave of wild-type COVID-19 is undertaken.

**Results:** We present our experience and summarize it into seven lessons learned, which will be elaborated on and explained in detail to the audience.

**Conclusions:** Having witnessed first-hand the confusion and chaos generated by the COVID-19 pandemic, we believe that the lessons we learned will help neurosurgeons worldwide be better equipped and prepared to respond to similar public health crises that may arise in the future.

## Oncology

Oral presentation

### Usefulness of 18-FET-PET in the differential diagnosis of progression vs. radiation induced anomalies in High Grade Glioma

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**Objectives:** To evaluate the accuracy of 18F-FET-PET for the differential diagnosis between radiation induced anomalies and disease recurrence in high-grade gliomas (HGG).

**Background:** Pseudoprogression and radiation necrosis are the most important post-treatment radiological changes after adjuvant radiotherapy and chemotherapy in HGG. These anomalies could simulate disease recurrence on MRI.

**Methods:** We retrospectively selected 27 patients operated on at Bozen hospital with a diagnosis of high-grade glioma who performed 32 studies with 18F-FET-PET. To evaluate the positivity of the test, the kinetics of the uptake and the value of SUV and TBR were considered. Patients with positive 18F-FET-PET were reoperated, while patients with negative 18F-FET-PET were followed up with MRI every 3 months.

**Results:** Of the 32 18F-FET-PET 14 were negative, of these 3 tests were false negatives (followed by recurrence within three months), while 18 tests resulted positive (histological confirmation). Patients with glioblastoma who died as of December 2022 (11 total) had a median survival of 23 months and a mean survival of 26.4 months. Currently deceased patients with grade III glioma (4 total) had a median survival of 62.5 months and a median survival of 68 months. The 18F-FET-PET in our series has values of sensitivity, specificity, positive and negative predictive value of 85.7%, 100%, 100% and 78.6%, respectively. In our series, 18F-FET-PET has shown excellent reliability in identifying patients with disease recurrence who can therefore benefit from a new intervention and/or further adjuvant therapies. In the case of small lesions on MRI and a negative 18FFET PET, a close follow-up must instead be considered due to the risk that the resolution limit of the PET method may give false negatives. Survival in our group showed data similar to the Literature.

**Conclusions:** The 18F-FET-PET is reliable in the differential diagnosis between pseudoprogression and radiation induced anomalies, facilitating the treatment strategy in HGG patients.

## Neurovascular Surgery

ePoster presentation

### Defying the laws of cerebral revascularization: the rare but real association of moyamoya and antiphospholipid antibody syndrome

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**Objectives:** To report on this association, its particular features, and management implications.

**Background:** The association of moyamoya syndrome with antiphospholipid antibody syndrome (APLS) is extremely rare.

**Methods:** Case report and literature review.

**Results:** A 49-year old woman with a history of recurrent ischemic strokes since her late 20's, presented with a new right middle cerebral artery (MCA) territory infarction and fluctuating, blood pressure-dependent neurologic deficits. Cerebral angiography revealed atypical bilateral moyamoya, more advanced on the right side, with distal vascular occlusions involving the middle, anterior, and posterior cerebral arteries. SPECT imaging demonstrated reduced cerebrovascular reserve throughout the right cerebral hemisphere. Stroke workup also revealed the presence of anticardiolipin antibodies, consistent with APLS. The patient was started on intravenous heparin and was offered urgent surgical cerebral revascularization. She was taken off heparin temporarily and underwent a combined, direct-indirect right superficial temporal artery (STA) to MCA bypass with encephalodurosynangiosis. Intraoperatively, despite a technically seamless end-to-side microvascular anastomosis, the direct bypass kept thrombosing despite multiple troubleshooting efforts. Intraoperative and postoperative angiography confirmed failure of the direct bypass graft. Postoperatively, the patient was restarted on full-dose systemic anticoagulation and had an uneventful recovery, with gradual resolution of her fluctuating neurologic deficits. She has since remained symptom-free and stroke-free for over 3 years. Repeat cerebral angiography at 8 months showed complete recanalization of the STA-MCA bypass graft with robust right hemispheric reperfusion. Repeat SPECT confirmed restoration of the right hemispheric cerebrovascular reserve.

**Conclusions:** The association of moyamoya syndrome and APLS is exceedingly rare but real. Aggressive systemic anticoagulation in this patient population is paramount. Specifically, our experience suggests that intravenous heparin should be continued intraoperatively to maximize the likelihood of direct bypass patency. Fortunately, early bypass failure in this setting appears to be potentially reversible, provided full-dose systemic anticoagulation is administered in a timely fashion.

## Education, Ethics, Socioeconomic

ePoster presentation

What is the relevance of art for a spinal neurosurgeon?

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**Objectives:** To share the learning about preserving the tattoos during lumbar spine surgery.

**Background:** Tattooing has been practiced for centuries in many cultures spread throughout the world and since 1990s they have become a mainstream part of global and especially Western fashion. By the 2010s, even the Barbie doll was tattooed although it did attract some controversy.

**Methods:** All those patients undergoing lumbar spine surgery from April 2008 to March 2023 who consented to having their tattoos photographed before and after the operation were included in the study. They had their pre-operative photographs of the operative area including tattoos taken and most of them had their post-operative photographs also taken at various intervals depending on their convenience. Author carried out retrospective review of the results with regard to the post-operative scar including the tattoos for these patients. A separate questionnaire was designed to evaluate patient satisfaction with regard to their tattoos in addition to the standard patient reported outcome measures.

**Results:** Tattoos on humans are a type of body modification largely used for cosmetic purpose. Tattoos may get distorted if they cover surgical incisions and those in the lower back are commonly seen in spinal surgical practice.

**Conclusions:** The Oxford English Dictionary gives the etymology of tattoos as " In 18th c. tattaow, tattow. from Polynesian tatau. In Tahitian, tatu." The word tatau was introduced as a loan word into English, the pronunciation being changed to conform to English phonology as "tattoo".

Indeed, the island of Great Britain takes its name from tattooing, with Britons translating as 'people of the designs' and the Picts, who originally inhabited Britain, literally meaning 'the painted people'.

The American Academy of Dermatology distinguishes 5 types of tattoos; traumatic, also called "natural tattoos"; amateur; professional; cosmetic, also known as "permanent makeup"; and medical tattoos.

A perfect result is possible.

## Neurovascular Surgery

ePoster presentation

### Spontaneous intracranial pseudoaneurysms in adults: florid spot signs and early hematoma recurrence

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**Objectives:** To report a unique case of spontaneous pseudoaneurysm of the distal middle cerebral artery resulting in recurrent intracerebral hemorrhage in an adult.

**Background:** Spontaneous intracranial pseudoaneurysms in the absence of trauma or infection are exceptionally rare lesions, only reported in children.

**Methods:** Case report and literature review.

**Results:** A 49-year old non-hypertensive woman presented with a rapidly deteriorating level of consciousness and Glasgow coma score of 9. Head CT revealed a large left hemispheric intraparenchymal hematoma with transtentorial herniation. CTA revealed multiple spot signs, consistent with active hematoma expansion. The patient underwent emergency craniotomy and hematoma evacuation. Despite seemingly adequate hemostasis, the patient suffered recurrent hemorrhage a few hours later, necessitating decompressive craniectomy and exploration of the hematoma cavity. Though active hemorrhage was encountered, the exact source of bleeding could not be identified. Cerebral angiography was obtained postoperatively, uncovering a pseudoaneurysm of the postcentral branch of the left middle cerebral artery, which was microsurgically obliterated with preservation of the parent vessel. The patient had an uneventful postoperative course with slow gradual neurologic recovery. A complete sepsis workup, including echocardiography, was negative. Seven weeks later, the patient experienced a recurrent large left hemispheric intraparenchymal hemorrhage. Repeat angiography revealed a new spontaneous pseudoaneurysm of the angular branch of the left middle cerebral artery. Following emergency hematoma evacuation and microsurgical excision of the pseudoaneurysm and parent vessel, pathologic and microbiologic examinations revealed no underlying infection or vasculitis. Postoperatively, the patient continued to exhibit very slow neurologic recovery, though her family ultimately opted for comfort care and transfer to hospice.

**Conclusions:** Though exceptionally rare, spontaneous intracranial pseudoaneurysms can occur in adults, potentially causing recurrent intracranial hemorrhage. Their presence should be suspected in patients with florid spot signs on CTA, especially those with early hematoma recurrence. The importance of catheter angiography in this setting cannot be overemphasized.

## Skull Base

ePoster presentation

### The morphometry of the pterion and its relation to anterior branch of middle meningeal artery in Black South Africans

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**Objectives:** To determine the morphometric position of the pterion and its relation to anterior branch of the middle meningeal artery (AMMA) in the black South African population.

**Background:** The pterion is an irregular H-shaped suture found in the norma lateralis of the cranium. It is a landmark used to locate and access the middle meningeal artery and its branches, Broca's motor speech area in the left hemisphere, lesions and tumors in the optic canal, sellar and parasellar regions, and vascular disorders in the anterior and middle cranial fossa through a classical or modified pterion craniotomy. However, there is a paucity of pterion morphometric data from South Africa to guide planning of minimal invasive procedures and to minimize intraoperative modifications resulting from Euro-Asian metric data.

**Methods:** One hundred and ninety-nine dry skulls of black South Africans (92 females and 99 males) were investigated. The morphology of the pterion was classified according to Murphy, (1956). The extracranial position, intracranial metric relation of the pterion to bony landmarks, and AMMA were measured bilaterally.

**Results:** The pterion was found in the anterior (51.3%) and middle (22.51%) cranial fossa, 31.98 ±5.20mm posterior to the frontozygomatic suture, and 40.25 ±3.41mm superior to the zygomatic arch. Intracranially, it was measured at 12.53 ±5.55mm to the sphenoid ridge and 40.94 ±4.03mm to the optic canal. AMMA was found posterior to the pterion (82.2%) and lies within a radius of 2-10mm from the center of the pterion.

**Conclusions:** In the black South African population the pterion lies significantly anterior compared to Euro-Asian morphometric studies. Consequently, a burr-hole pterion craniotomy will result in a posteromedial approach instead of Euro-Asian anteromedial approach to superior orbital fissure, more distant optic canal, and parasellar regions. AMMA can be preserved for bypass procedure by placing the burr-hole and classical pterion craniotomy anterior to the pterion.

## Neurovascular Surgery

ePoster presentation

### Minimally invasive microsurgical technique for evacuation of deep intracerebral hematomas

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**Objectives:** To demonstrate a minimally invasive microsurgical approach for the evacuation of deep intracerebral hematomas (ICH).

**Background:** Despite the lack of conclusive outcome data, surgical evacuation of large, symptomatic ICH may be offered to patients on a case-by-case basis, aiming to prevent brain herniation, control intracranial pressure, relieve symptoms, and possibly facilitate or accelerate recovery. For deep ICH, minimally invasive techniques, which limit operative damage to healthy brain tissue, are generally preferred. Although new tube and endoscope-based techniques are currently being studied, those elaborate techniques are not widely available and often require special equipment and/or expensive disposable material.

**Methods:** Operative video.

**Results:** This minimally invasive microsurgical technique relies on the use of careful preoperative planning, frameless stereotactic neuronavigation, and meticulous microsurgical technique. It involves small craniotomies, infracentimetric corticotomies, and physiologic subcortical white matter dissection, leading to very limited disruption of healthy brain tissue, akin to tube and endoscope-based procedures. We acknowledge that this technique or a modification thereof may currently be in use by other neurosurgeons in their practice. However, to the best of our knowledge, a step-by-step microsurgical video illustration of this technique has not been previously published.

**Conclusions:** While this technique can be broadly used by neurosurgeons, irrespective of the hospital setting, it would be particularly valuable in settings where expensive cutting-edge technology is not readily available.



## Oncology

ePoster presentation

Surgical resection of multiple metastatic brain tumors in patient with poor preoperative KPS by minimal invasive technique

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**Objectives:** In our study, we examined if the surgical treatment of metastatic brain tumors (MMBT) by minimal invasive brain surgery (MIBS) in one sitting improves the expected survival and quality of life in patient with a poor preoperative KPS.

**Background:** Surgical removal of multiple (three or more) MMBT remains controversial. It requires multiple craniotomies resulting in longer operation time and increased risk. The introduction of MIBS techniques allows us to remove MMBT in one setting within an acceptable time frame and with low risk. Current publications proved that removing MMBT in one setting was equivalent to the surgical treatment of soliter metastatic brain tumors if complications and survival rate was compared. On the other hand, there is no data available on whether the removal of MMBT in the case of poor preoperative KPS (<60) holds any positive prognostic value.

**Methods:** 15 patients with MMBT were included in our study who were operated at our Department between 2017-2020. The following factors were used to evaluate the surgical outcome: number of removed tumors; number of craniotomies; improvement in KPS; survival; duration of operation; postoperative care.

**Results:** Overall 46 tumors were removed from 32 craniotomies. KPS showed improvement in 78% cases, in 21% the KPS remained the same and only one patient showed deterioration. The average survival was 10.2 months. The average length of the operation was  $3,1 \pm 1,62$ . 80 % of the patient were discharged on the second or third postoperative day.

**Conclusions:** According to our results, it can be concluded that surgical treatment by minimal invasive technique of MMBT patient even with poor preoperative KPS improve survival rate and quality of life and it is associated with low surgical risk.

## Oncology

ePoster presentation

### Multiple locations of Schwannoma in brain and spinal cord with NeuroFibromatosis type 2: case report and literature review

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**Objectives:** We present a case of NF2 with brain and spinal cord involvement and challenges in the management.

**Background:** Neurofibromatosis type 2 (NF2) is a rare, genetic, autosomal dominant neurological disease caused by a mutation in the NF2 tumor suppressor gene. The disease results in several benign tumors of the nervous system, usually vestibular or spinal schwannomas, meningiomas and ependymomas.

**Methods:** We report a case of NF2 of a 30-year-old male admitted in the Emergency Department of our hospital.

**Results:** A 30-year-old male was admitted in the Emergency Department of our hospital, complaining of headache, nausea, vomiting and bilateral hearing impairment with

swallowing and gait disorders for 5 years with more recently a heaviness of the 4 limbs, especially distal, making walking impossible and the sudden onset of genito-sphincter disorders. Clinically, he had elevated intracranial pressure, left cerebellopontine syndrome, and cervical spinal cord compression syndrome ASIA C. A brain and spinal cord Magnetic Resonance Imaging (MRI) showed a quadri-ventricular hydrocephalus due to a bilateral vestibular schwannoma associated with a spinal schwannoma compressing the spinal cord in C4.

He was diagnosed with NF2 and underwent a ventriculoperitoneal shunt first before removal of the symptomatic intradural extramedullary mass in the cervical region, which histology revealed a schwannoma. His motor deficit has slightly decreased after the surgery. A follow-up MRI showed resolution of the hydrocephalus with no tumor residue at C4. He was therefore scheduled for a third procedure to remove his stable left vestibular schwannoma. The patient was referred to the neuro-oncology unit for any adjuvant treatment.

**Conclusions:** Schwannomas grow slowly in most NF2 patients, but these multiple craniospinal tumors can present some challenges in the management regarding which location should be operated first without compromising the outcomes.

## Oncology

ePoster presentation

### Giant invasive granulosa cell tumor of the lumbar spine and cauda equina

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**Objectives:** To report an exceptional case of giant invasive Granulosa cell tumor (GCT) of the lumbar spine and cauda equina.

**Background:** GCT is a rare ovarian sex cord stromal neoplasm that is typically diagnosed in young patients, leading to frequent recurrences later in life. Local invasion and metastasis within the retroperitoneum is rare, but typically responds to surgery and chemotherapy. In contrast, direct invasion of the spine has not been previously reported.

**Methods:** Case report and literature review.

**Results:** A 65-year old woman presented with a chronic cauda equina syndrome of 2-year duration. CT and MRI of the lumbar spine revealed a giant retroperitoneal lesion eroding through the lumbar spine with severe thecal sac compression. The patient underwent multilevel decompressive laminectomies, posterolateral instrumented fusion of the lumbar spine, and partial resection of lesion via a posterior approach. Intraoperatively, the lesion was found to be both extradural and intradural. Pathologic examination confirmed the diagnosis of GCT. Postoperatively, the patient underwent several cycles of chemotherapy without significant response.

**Conclusions:** Though exceedingly rare, GCTs can potentially grow to giant sizes and locally invade the retroperitoneum and lumbar spine.

## Functional

Oral presentation

Comparison of the outcome of deep brain stimulator surgeries in Parkinson's disease of frame based and frameless stereotactic systems

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**Objectives:** In our study we compared the two surgical technique and the long term outcome of the patients, as the latter has never been studied before.

**Background:** Deep brain stimulation surgery (DBS) plays an important role in the treatment of Parkinson's disease (PD). The standard surgical technique requires the stereotactic frame. In the last decade frameless techniques, such as the NexFrame system has evolved. Several studies showed that it is not inferior to the stereotactic frame in terms of precision.

**Methods:** 23 patients were included in the study who was operated at our Department between 2019-2022. 13 patients were operated by RM stereotaxic frame and 10 patients with NexFrame. Intraoperative 3D X-ray was used to verify the electrodes final position. To compare the two techniques the duration of surgery, degree of electrode deviation and postoperative functionality at one year (decrease in levo-dopa dose and in MDS-UPDRS III) were defined.

**Results:** The average duration of surgery was 6:31 and 4:51 with the stereotactic frame and the NexFrame, respectively. Deviation from the original plan was 1.315 mm and 1.111 mm (stereotaxic frame), 1.696 mm and 1.329 mm (NexFrame) on the right and left side. Decrease in the levo-dopa was 449 mg in the stereotaxic group and 390 mg in the NexFrame group. Improvement in the MDS-UPDRS III. was 62.476 % for the stereotaxic group and 75.911 % for the NexFrame group. Statistically significant difference was seen only in the operation time ( $p=0.05$ , Mann-Whitney U-test).

**Conclusions:** According to our results performing DBS surgery in PD with NexFrame system is not inferior to the stereotactic frame if we compare the surgical precision and long term outcome. The operation time on the other hand is significantly shorter with NexFrame, which is a clear benefit for the patients.

## Oncology

ePoster presentation

### Management and outcome of operated NF2 associated spinal ependymomas

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**Objectives:** To evaluate the clinical effects of surgery for symptomatic and/or progressive Neurofibromatosis Type 2 (NF2) associated spinal ependymomas.

**Background:** Intramedullary ependymomas are a common finding in NF2. However, there is a great lack of evidence in regard of treatment of choice in these cases.

**Methods:** We retrospectively reviewed clinical reports and T1- and T2-weighted magnetic resonance images in 180 patients with NF2. 116 patients were excluded due to the absence of ependymomas (109 patients) or to the lack of data (7 operated ependymoma patients). Neurological function before and after surgery was classified using an established scoring system including the 5 categories sensibility (incorporating pain), motor, bladder/bowel and gait function. Preservation of neurological function was determined as maintenance of scoring class.

**Results:** Of the remaining 64 patients (~36%), 13 patients required surgery either due to rapid growth progression (2/13,  $\triangleq$ 15%), worsening of neurological function (8/13,  $\triangleq$ 62%) or of both combined (3/13, 23%). The most common symptoms indicating for surgery were gait disturbances (7/13,  $\triangleq$  54%), followed by sensory and motor deficits and pain (4/13,  $\triangleq$ 31%) and lastly bladder and bowl impairments (3/13,  $\triangleq$ 23%). Twelve patients exhibit two or more symptoms before surgery. The clinical appearance remained stable in 46% (6/13), improved in 23% (3/13) and worsened in 31% (4/13) of patients within the first 24-months of follow-up after surgery.

**Conclusions:** The majority of NF2 patients with spinal ependymomas is asymptomatic and does neither require treatment nor biopsy for securing the diagnosis as these tumors totally behave different compared to sporadic forms. In cases with developing neurological symptoms mostly combined with rapid tumor progression, surgical intervention appears to be a promising and low-risk approach in experienced hands to maintain or improve (69%) the neurological function. Nevertheless, bevacizumab treatment in adult NF2 patients should be considered individually as alternative treatment modality.

## Skull Base

Oral presentation

The risk of intraoperative venous air embolism during neurosurgery in lounging (semi-sitting) position re-visited: single center study with 1,000 cases

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**Objectives:** To evaluate the number and severity of venous air embolism (VAE), consecutive complications and outcome in patients operated in the lounging position.

**Background:** Sitting and semi-sitting positions have been abandoned by various institutions due to additional risks, above all the risk of perioperative VAE.

**Methods:** From 2010 to 2020 a total of 1,000 patients were operated in the lounging. 172 patients had a persistent foramen ovale (PFO), as detected by preoperative bubble test. All patients were intraoperatively monitored by continuous transesophageal echocardiography (TEE). The number and severity of VAEs were documented by the anesthesiologist according to the Tuebingen classification system for VAE (TCS\_VAE). Early (<24h) postoperative CT scans and patient's clinical condition were analyzed for complications.

**Results:** Five patients had cervical spine surgery, and 995 patient underwent suboccipital craniotomy. Median duration of surgery was 204 minutes. About half of patients had no TEE signs of VAE at all. VAE was detected in 51.4% of patients, a change in etCO<sub>2</sub> (grade 2-5 according to TCS\_VAE) occurred in 10.2%. No patient presented with hemodynamic instability (grade 5 TCS\_VAE). Patients with high-grade VAEs were significantly older (p=0.02) and had lower body-mass indexes (p=0.001). Acute respiratory distress syndrome (ARDS) was diagnosed in 0.3% of all cases (n=3) and was associated with perioperative VAE (p<0.001). No patient presented with new permanent neurological deficits due to paradoxical VAE. VAE grade was not associated with any of the outcome parameters Karnofsky score, duration of ventilation, duration of ICU and hospital stay or cranial nerve palsy.

**Conclusions:** No severe or fatal adverse events attributable to positioning were observed in this large cohort and overall outcome was favorable. This study confirms that the lounging position can be safely performed in an experienced team even in patients with a PFO and the focus should be directed to its possible advantages.

## Spine

Oral presentation

### Revision surgery for proximal junctional failure: a single-center analysis of 54 adult spinal deformity patients with long-term follow-up

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**Objectives:** Identify mechanisms of failure and revision strategies for adult spinal deformity (ASD) patients with proximal junctional kyphosis/failure (PJK/PJF) after posterior long instrumented fusion to the pelvis.

**Background:** PJK is a radiographic complication following ASD surgery related to degeneration of mobile segments adjacent to fused spine. PJF represents PJK with vertebral fracture, soft-tissue disruption, or instrumentation failure. Complex revision surgery for PJF may entail extension of fusion above the uppermost instrumented vertebra (UIV).

**Methods:** A single-center retrospective review was performed for ASD patients who underwent revision surgery (2009-2021) for PJF after posterior instrumented fusion to the pelvis. PJK was defined by a proximal junctional angle (PJA)  $\geq 10^\circ$  and at least  $10^\circ$  greater than the baseline measurement. Patients were stratified by upper thoracic (UT, T2-T6), lower thoracic (LT, T8-T11), or lumbar spine (L, L1-L3) UIVs. Outcomes of interest include indications for revision surgery and complications.

**Results:** Of 1180 patients, 54 (4.6%) developed PJF and underwent revision (mean  $65.0 \pm 6.8$  years, 59% female, mean BMI  $30.3 \pm 5.9$  kg/m<sup>2</sup>). Average follow-up after revision was  $3.1 \pm 2.7$  years. Mean number of levels fused at index surgery was  $8.4 \pm 3.1$ , with 10 UT (18.5%), 35 LT (64.8%), and 9 L (16.7%) UIVs. Mechanisms of PJF were vertebral fracture (UT 40.0%, LT 60.0%, L 33.3%), soft-tissue disruption (UT 30.0%, LT 42.9%, L 44.4%), and hardware failure (UT 30.0%, LT 25.7%, L 55.5%). Radiographic parameters were measured including  $\Delta$ PJA (UT  $19.1 \pm 11.0^\circ$ , LT  $14.8^\circ \pm 4.0^\circ$ , L  $16.0^\circ \pm 9.0^\circ$ ). Twenty-two patients (40.7%) were revised after revision surgery ( $17.9 \pm 15.3$  months), requiring further proximal extension of fusion (UT  $3.7 \pm 1.9$  levels, LT  $6.0 \pm 1.6$  levels, L  $4.6 \pm 1.9$  levels).

**Conclusions:** Nearly half of ASD patients revised for PJF after long-segment posterior instrumented fusion were revised again. These patients should be monitored closely to facilitate patient-surgeon counseling and complication management.

## Oncology

ePoster presentation

### Atypical intradiploic meningioma

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**Objectives:** Describe a case of an atypical intradiploic meningioma.

Present the management of an unusual case of Grade 2 meningioma with intradiploic involvement.

**Background:** Meningiomas are the most common intracranial primary tumors, originating from arachnoid cells. The vast majority correspond to grade 1, but the grade 2 and 3 are uncommon, especially with intradiploic involvement.

**Methods:** A 68-year-old woman with no relevant medical history, went to the Emergency Department due to paresis of the right upper limb and alteration of language and behavior of one week of evolution.

On examination, a painless, hard left frontal lesion was evident, adhered to deep planes, without knowing how to specify the time of evolution.

A contrast-enhanced CT revealed a left frontal bone lesion that extended to the contralateral side, inflated the internal and external table of the bone and associated an important periosteal reaction, measuring 8.1 x 3.3 cm (T x AP). It presents an intracranial soft tissue component with a broad dural implantation base that enhances intensely in the post-contrast study and is associated with significant vasogenic edema.

Contrast-enhanced MRI showed findings consistent with a meningioma with a large left frontal intraosseous component.

**Results:** The patient underwent elective surgery, performing a bifrontal craniotomy with healthy tumor margins, achieving macroscopically complete resection of intracranial tumor that was sent for pathology (AP) study. Duroplasty with a suturable patch and cranioplasty with polymethylmethacrylate (PMMA) were performed to cover the bone defects we had created.

**Conclusions:** Finally, the patient received rehabilitation treatment, progressively improving the weakness in the arm and the alteration of language. A postoperative CT showed complete tumor resection, with persistent edema but without associated complications. Given the extent of the tumor and the AP result (grade 2 meningioma with extensive bone involvement), the patient underwent adjuvant RT as a complementary treatment.



## Endovascular Neurosurgery

ePoster presentation

Dural arteriovenous fistulas: retrospective study of an institutional series of a reference center in the metropolitan region of Curitiba

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**Objectives:** To characterize the epidemiological profile of DAVFs between September 2014 and December 2018 in a reference center in the metropolitan region of Curitiba.

**Background:** Dural arteriovenous fistulas (DAVFs) are pathological communications within the thickness of the dura mater, between durals arteries and venous sinuses, meningeal veins or cortical veins, or a combination of these. They are generally considered benign lesions, and endovascular treatment is an effective option, although specific indications and contraindications guide the type of approach. DAVFs account for 10-15% of all intracranial vascular malformations.

**Methods:** A retrospective study of 16 DAVFs found after 3.898 arteriographies. Data were recorded on a structured form, subjected to statistical analysis, and discussed descriptively. The AVFs were classified according to Casasco/Cognard criteria.

**Results:** Sixteen DAVFs were found, with a prevalence of 75% in males and 25% in females. Regarding the Casasco/Cognard classification, 7 were type I, one was type II6, 2 were type IIa/b, 2 were type III, and 4 were type IV. The left side was more affected, representing 56.25% of cases, followed by the right side (31.25%) and those located in the midline and bilateral sides (6.25% each). Nine cases (56.25%) were successfully embolized. The most affected region was the left temporal-occipital area, representing 37.50% of cases, followed by the right temporal-occipital area, right occipital area, left occipital area (all with 12.50% prevalence), and the midline, right temporal, left temporal, and bilateral temporal areas (each with 6.25% prevalence).

**Conclusions:** It was found that the epidemiological profile of DAVFs showed a higher prevalence in males than in females, with left side dominance. Analyzing the Casasco/Cognard classification, the majority were type 1 (43.75%). The dominant region was the temporal-occipital area, corresponding to 37.50%.

## Functional

ePoster presentation

### Effectiveness of spinal cord stimulator for urethral and perineal pain. Case report

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**Objectives:** Describe an out of the box indication of spinal cord stimulator for urethral pain.

Increase, with more studies, different indications for spinal cord stimulator.

**Background:** Spinal cord stimulator (SCS) have been established safe to treat chronic pain of multiple etiologies.

Indications are neuropathic pain that have failed with conventional medical treatment.

The mechanism of action consists of neuromodulation through the application of electricity in the dorsal column, intervening in the ascending pathways that carry painful impulses to the brain.

**Methods:** 53-year-old patient with a history of childhood cerebral palsy with secondary dystonic tetraparesis, treated with baclofen pump. He developed urethral and perineal pain.

He was diagnosed with pudendal neuralgia in follow-up with the pain unit and urology. Moderate pain relief with perineal stimulation using vibrators. They decided to place a sacral root stimulator without improving his pain. He went to the neurosurgery for post-surgical follow-up of the L5-S1 laminectomy accompanying his wife who is a carrier of a spinal pain stimulator and asked about the possibility of this treatment.

**Results:** We decided to implant a surgical spinal cord stimulator with an electrode at the level of D9 D10. The next day after surgery, the stimulator was turned on and after a week he reported complete improvement in urethral and perineal pain, improving his quality of life.

**Conclusions:** Spinal cord stimulator is a minimally-invasive procedure, safe and cost-effective therapeutic option for numerous chronic pain conditions. Other indications are cases of refractory neuropathic pain complicated by drug side effects, tolerance, or the need for re-operation.

The urethral pain in this patient improved significantly with subsequent reduction of pain treatment.

## Trauma

ePoster presentation

### Diagnosis of dural arteriovenous fistula from extradural hematoma incompatible with trauma mechanism regarding a case

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**Objectives:** To report a case of dural arteriovenous fistula from extradural hematoma incompatible with trauma mechanism.

**Background:** Male patient, 32 years old with a history of Acute Myocardial Infarction at the age of 24. Admitted to the emergency room with a history of seizures followed by cranioencephalic trauma and complaints of severe headache, nausea, vomiting. On examination, the patient was confused and had no focal neurological deficit. Cranial computed tomography (CT) was performed, which showed a hyperdense area in the region of the superior sagittal sinus, compatible with an extradural hematoma. The patient was initially submitted to conservative treatment. The arteriography showed a dural arteriovenous fistula (DAVF) grade IIB Casaco/Cognard, right parietal, nourished by branches of the right carotid-ophthalmic artery. The patient underwent DAVF embolization and evolved with clinical improvement and, after hospital discharge, did not continue the outpatient follow-up.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2022.

**Results:** Vertex epidural hematomas are uncommon, with an incidence ranging from 0 to 8% and mortality of up to 50%. Bleeding from the superior sagittal sinus (SSS) is the main source. The main causes are fractures and sutural diastasis. DAVF are responsible for approximately 10% of all intracranial vascular malformations. The presence of retrograde venous drainage and cortical venous reflux increases the risk of hemorrhage, neurological damage, severe symptoms. Approximately 20% to 33% of DAVFs have intracranial hemorrhage, the most common being intraparenchymal and subarachnoid. The patient described had unusual imaging findings according to the clinical history. We opted for arteriography, which showed DAVF.

**Conclusions:** The importance of knowledge of this pathology is of fundamental importance, in order to provide an early diagnosis and an effective treatment, as well as the follow-up of the patient to evaluate the recanalization of the DAVF.

## Spine

ePoster presentation

Obliteration of the lumbar spinal canal by a centrally lodged, extradural bullet in a patient with minimal neurologic compromise

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**Objectives:** To present a remarkable case of a complete obliteration of the spinal canal by a bullet with minimal signs or symptoms.

**Background:** Penetrating gunshot wounds (GSWs) to the spinal column are rare injuries that often result in permanent disability. Specifically, bullets traversing the spinal canal will usually tear the dura and damage the spinal cord or cauda equina. We present a unique and intriguing case of a retained bullet occupying the center of the lumbar spinal canal, virtually obliterating it, while remaining extradural and causing minimal neurologic deficits.

**Methods:** Case report and literature review.

**Results:** A 20-year old man sustained multiple gunshot wounds to the chest and abdomen, with a retained bullet in the spinal canal at L5, corresponding to an entry wound in the left buttock. CT revealed the bullet to be located in the center of the spinal canal, virtually obliterating it. The patient exhibited only moderate motor deficits and neuropathic pain in the distal left leg and foot, consistent with L5 and S1 radiculopathies. He also reported some perineal paresthesias and urinary urgency. However, the remainder of his neurologic exam was unremarkable. Decision was made to remove the bullet via an L5 laminectomy. Intraoperatively, the bullet was unexpectedly found to be entirely extradural in location, compressing and displacing the thecal sac to the right side, with no visible damage to the dura and cauda equina. The patient had an uneventful postoperative course with rapid clinical improvement, and was discharged home a few days later.

**Conclusions:** Though exceedingly rare, a retained bullet that, on imaging, appears to obliterate and/or occupy the center of the spinal canal, might be extradural in location. Such a rare event should be suspected in patients with an unexpectedly good neurologic exam, contrasting with imaging findings.

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## Spine

Oral presentation

### Surgical outcomes endoscopic lumbar spine surgery with EasyGO System in obesity patients

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**Objectives:** The goal of the study was to assess the surgical outcomes endoscopic spine surgery with the EasyGO! System in obesity patients.

**Background:** Surgical treatment of spine pathology of patients with obesity is an urgent problem of modern society.

**Methods:** We analyzed 403 spine endoscopic procedures from 2011 to 2022. Based on the BMI-Index were selected 85 patients with various degrees of obesity. The sample with class 1 obesity consisted of 59 (69%) patients, with class 2 obesity - 16 (19%), and with class 3 obesity - 10 (12%). The average age was of 55 years.

**Results:** The surgery was performed on prolapsed discs in 58 (68%) patients, on synovial cysts in 10 (12%) and on the lumbar spinal canal stenosis in 17 (20%). In 73 (86%) patients was operated one level, in 11 (13%) patients two levels and by 1 (1%) for levels. The most common level for surgery was L4/5 (43%). The patients were admitted to the hospital with pain in 82 cases (96%), with paresis in 45 cases (53%), and with sensory deficits in 32 (38%) cases. The intraoperative dural sac tears rate consist 9%. There were no infectious complications. The mean of length of operation consist 64,45 min (SD=30,03). There were not statistically difference between the various groups of obesity (Kruskal-Wallis Test =1,27; p= 0, 593). In all cases was noted recovery of paresis. A complete recovery of sensory deficits was noted in 24 (75%) cases, and remained unchanged in 8 (25%) cases. Pain was completely relieved in 18 (12%) patients, partially in 64 (88%) patients. The mean of hospital stay after the operation is 5,4 days (SD=4,06). There were not statistically difference between the various groups of obesity (Kruskal-Wallis Test=0,44; p=0,978).

**Conclusions:** Endoscopic tubular surgery is an effective and safe technique for surgery the patients with different degree of obesity.

## Hydrocephalus

ePoster presentation

### A pragmatic and efficient clinical protocol for the prevention of ventriculostomy-related infections in neurosurgical patients

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**Objectives:** To present the outcomes of our single-center perioperative care bundle for external ventricular drain (EVD) management.

**Background:** Starting in 2018, a clinical protocol for EVD placement and periprocedural care was implemented in our regional trauma and primary stroke center, aiming to maximize efficiency and minimize complications. The protocol also emphasized aggressive early weaning of EVDs. Ventriculostomy-related infections (VRIs) in critically ill neurosurgical patients are common, complicating over 10% of EVD implantations.

**Methods:** All EVDs implanted between January 2018 and March 2023 were identified from a prospectively maintained procedural database. Patients with preexistent central nervous system infection were excluded. Medical records were retrospectively reviewed. Demographic, clinical, laboratory, and radiologic data were extracted and analyzed.

**Results:** During the study period, 72 EVDs were implanted in 61 patients, 42 men and 19 women with a mean age of 53.3 years (range 19-93). Indications for EVD were: hemorrhagic stroke in 28 (45.9%), traumatic brain injury in 17 (27.9%), ischemic stroke in 8 (13.1%), tumor in 6 (9.8%), hydrocephalus in 2 (3.3%). Median preoperative Glasgow coma score was 7 (range 3-15). EVD implantation was performed in the intensive care unit in 40 patients (55.6%), the emergency department in 16 (22.2%), and the operating room in 16 (22.2%). All patients received antibiotics perioperatively. Median EVD duration was 7 days (mean 8, range 1-21). An EVD infection occurred in 3 cases (4.2%), all of which had an EVD length of stay of 11 days or longer. EVD length of stay was found to be associated with infection on univariate analysis (mean: 15 days in infected group vs. 7.7 days in non-infected group,  $p=0.009$ ).

**Conclusions:** Using this pragmatic and efficient clinical protocol, a very low VRI rate in critically ill neurosurgical patients can be achieved. EVD length of stay remains the strongest predictor of VRI.

## Oncology

ePoster presentation

### Diffuse large B-cell lymphoma of the skull

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**Objectives:** To report a unique case of diffuse large B-cell lymphoma (DLBCL) originating primarily in the skull.

**Background:** DLBCL of the skull has only been reported in the setting of contiguous extension from underlying dural disease.

**Methods:** Case report and literature review.

**Results:** A 70-year old woman developed a rapidly growing lesion in her left forehead following minor trauma. CT and MRI revealed a large, enhancing, infiltrating skull lesion, involving large portions of the left frontal bone, with periosteal and epidural extension, reaching the roof of the superior sagittal sinus at the midline. The patient underwent resection of the lesion via a bifrontal craniectomy, followed by a cranioplasty. Pathologic examination confirmed the diagnosis of DLBCL.

**Conclusions:** DLBCL of the skull is an exceptionally rare pathologic entity that needs to be recognized in the differential diagnosis of skull lesions. While surgery is essential for tissue diagnosis, the mainstay of treatment remains chemoradiation.

## Hydrocephalus

ePoster presentation

Dialysis disequilibrium syndrome and Intracranial pressure fluctuations in neurosurgical patients undergoing renal replacement therapy: systematic review and pooled analysis

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**Objectives:** To present the literature on the impact of renal replacement therapy (RRT) on intracranial pressure (ICP) and dialysis disequilibrium syndrome (DDS).

**Background:** DDS is a rare, well-known, potentially life-threatening complication of RRT, often involving cerebral edema and increased ICP. However, the impact of RRT on ICP and rate of dialysis disequilibrium syndrome in neurosurgical patients have not been systematically assessed.

**Methods:** In February 2022, a systematic review following PRISMA guidelines was conducted using various combinations of 9 keywords in the MEDLINE database. Eleven papers were selected. Individual patient data were extracted, pooled, and analyzed.

**Results:** Fifty-eight patients, 44 men and 14 women with a mean age of 48 years (6-78 years), were analyzed. Neurosurgical conditions included the following: spontaneous intracranial hemorrhage (n = 27), traumatic brain injury (n = 16), ischemic stroke/anoxic brain injury (n = 6), intracranial tumor (n = 6), and others (n = 3). Neurosurgical interventions included the following: craniotomy/craniectomy (n = 23), external ventricular drain or ICP monitor placement (n = 16), and burr hole or twist drill craniostomy (n = 4). Intermittent dialysis was used in 33 patients, continuous RRT in 20, and a combination thereof in 4. During RRT, ICP increased in 35 patients (60.3%), remained unchanged in 20, and decreased in 3. Thirty-four patients (65.4%) died. Intermittent dialysis was associated with increased ICP (73% vs. 37.5%, P = 0.01) and mortality (75% vs. 39.1%, P = 0.01).

**Conclusions:** In neurosurgical patients, ICP increases during RRT are common, affecting up to 60%, and potentially life-threatening, with mortality rates as high as 65%. The use of a continuous rather than intermittent RRT technique may reduce the risk of this complication. Prospective studies are warranted.



## Trauma

Oral presentation

Mini-craniotomy technique with strict perioperative management protocol for chronic subdural hematoma evacuation can lead to near-zero recurrence and complication rates

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**Objectives:** To report our experience in treating chronic subdural hematomas (cSDH) using a mini-craniotomy technique.

**Background:** Recurrence rates after surgical evacuation of cSDH remain unacceptably high. Consequently, there is little consensus regarding the optimal surgical strategy and the role of middle meningeal artery embolization (MMAE). Since 2018, the senior author has adopted a consistent management strategy for cSDH, incorporating a parietal mini-craniotomy, wide opening of dura and outer hematoma membrane, panhemispheric large-bore subdural drains, and selective flat positioning of patients postoperatively.

**Methods:** All patients who, between 2018 and 2021, underwent surgical evacuation of a cSDH by the senior author, were identified from a prospectively maintained database. Charts were retrospectively reviewed and clinical, radiologic, operative, and outcome data were extracted.

**Results:** Fifty-three cSDH in 42 patients, 31 men and 11 women with mean age 64 years (range 23-95), were identified. Eleven patients presented with bilateral cSDH. Median preoperative GCS score was 14 (range 4-15). Nine patients were on antithrombotic therapy and were reversed accordingly. Mean hematoma size was 18 mm (range: 6-34) and midline shift 7 mm (range: 0-22). Surgery was technically successful in all patients. Median operative time was 64 minutes (range 29-140). There were no perioperative complications. Four patients (9.5%) died in the early post-operative period due to unrelated medical conditions. All survivors exhibited neurologic improvement with complete hematoma resolution by 3 months. No patient experienced hematoma recurrence or required reoperation.

**Conclusions:**

When surgically evacuating cSDH, near-zero recurrence and complication rates can be consistently achieved. Attention to detail in surgical technique and perioperative management are key to success. If such favorable surgical results can be universally reproduced, the role of endovascular MMAE is likely to diminish.

## Trauma

ePoster presentation

### Safety and effectiveness of mini-craniotomy evacuation of chronic subdural hematoma quantified: systematic review and pooled analysis

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**Objectives:** To determine the safety and effectiveness of mini-craniotomy evacuation techniques for chronic subdural hematoma (cSDH).

**Background:** Recurrence and reoperation rates after cSDH evacuation remain high, resulting in a lack of consensus regarding the optimal surgical strategy and the role of middle meningeal artery embolization. While recurrence rates tend to be highest with minimally invasive twist drill and burr hole strategies, traditional craniotomy techniques can be potentially morbid, especially in the elderly population. Though relatively underutilized, mini-craniotomy techniques may strike the perfect balance between maximal hematoma evacuation and minimal invasiveness.

**Methods:** Systematic review of MEDLINE, EMBASE, and Cochrane Central databases using a combination of 6 prespecified key words, according to PRISMA methodology. Individual patient data were extracted, pooled, and analyzed.

**Results:** Seventeen studies including 1,433 patients were included. Study design was: retrospective cohort (n=14), prospective cohort (n=2), case report (n=1). The majority of patients (69%) were men and mean age was 72 years (range 18-102). One-sixth of patients (16.7%) had bilateral cSDH. Mean preoperative GCS was 12 (range 3-15). In 6 studies where preoperative medication use was specified, 27.6% of patients were on antithrombotic therapy. Mean hematoma size was 21.4 mm and midline shift 7.2 mm. Overall surgical morbidity and mortality rates were 5.7% (range 0-19) and 0.2% (range 0-1.6), respectively. Overall hematoma recurrence rate was 10% (range 0-35). In 7 studies (N=243) where this information was available, nearly two-thirds (66%) of patients who had a hematoma recurrence required reoperation (recurrence: 9.9%, reoperation: 6.5%).

**Conclusions:** Mini-craniotomy techniques result in low cSDH recurrence rates, while reducing morbidity and mortality relative to traditional craniotomy. Prospective studies and randomized trials may be warranted.

## Spine

ePoster presentation

### Revisiting “stable” injury in the era of evidence-based guidelines: failure rate and risk factors of conservatively managed cervical spine trauma

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**Objectives:** To determine the rate of and risk factors for failure of conservative management (rigid external bracing) in patients with “stable” traumatic cervical spine injuries.

**Background:** In this era of evidence-based guidelines, the success and failure rates of conservative management for traumatic cervical spine injuries that are deemed “stable” have not been closely examined.

**Methods:** All consecutive adult patients presenting with a traumatic cervical spine injury between 2015 and 2018, who underwent CT and MR imaging of the cervical spine and were treated conservatively, were included. Patient charts were retrospectively reviewed and demographic, clinical, radiologic, and outcome data were recorded. Specifically, the success or failure of conservative management was documented. MRIs were re-reviewed by an experienced neuroradiologist and discoligamentous injuries were graded using the SLIC system. Predictive variables were analyzed using univariate analysis.

**Results:** Thirty-four patients, 19 men and 15 women with mean age 54 years (range 18-91). Trauma mechanisms were: fall (n=22), motor vehicle accident (n=8), assault (n=3), unknown (n=1). CT showed fractures in 28 patients (82%): lateral mass/articular process (n=10), odontoid (n=7), vertebral body (n=5), lamina (n=5), pedicle (n=1). MRI revealed discoligamentous injuries in 23 (67%). Four patients (11.8%) failed conservative management, 3 of whom underwent surgical stabilization and arthrodesis, while one elderly patient was kept indefinitely in a rigid collar. On univariate analysis, no variables were found to predict failure of conservative management.

**Conclusions:** In this modern era of evidence-based management guidelines, nearly 1 in 8 patients with “stable” traumatic injuries of the cervical spine still fail conservative management. In this small series with limited statistical power, no predictive variables could be conclusively identified. Prospective studies are thus warranted. Until then, patients with “stable” injuries should be informed of the small but real risk of failure under conservative management and should be monitored accordingly.

## Trauma

Oral presentation

### Are bilaterally fixed and dilated pupils the kiss of death in patients with transtentorial herniation? Systematic review and pooled analysis

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**Objectives:** To determine the survival rate and functional outcomes in patients with transtentorial herniation and bilaterally fixed and dilated pupils (BFDP) following emergency decompressive surgery.

**Background:** BFDP in the setting of transtentorial herniation due to a space-occupying lesion have traditionally been considered a sign of futility. As a result, such patients may be denied life-saving decompressive surgery, resulting in very high mortality rates.

**Methods:** This was a systematic review of MEDLINE, Embase, Cochrane, and Google Scholar databases, using a combination of 15 prespecified keywords, according to Preferred Reporting Items for Systematic reviews and Meta-Analyses methodology. Individual patient data were extracted, pooled, and analyzed.

**Results:** Twenty-two studies totaling 503 patients were included. Study designs were as follows: prospective cohort (n = 1), retrospective cohort (n = 15), and case report (n = 6). Nearly two thirds of patients (67.7%) were male. The mean age was 41 years (range = 3-82). The median preoperative Glasgow coma scale was 3 (range = 3-6). Nearly two thirds (66.9%) underwent surgical decompression within 2 hours of pupillary changes. The mean follow-up was 7 months (range = 1-40). Two thirds (67%) died. Among survivors, 50.5% had severe disability (Glasgow outcome scale = 2-3), while 49.5% had a good outcome (Glasgow outcome scale 4-5), representing 17% of the whole population. Given the methodological limitations, the prognostic value of age, Glasgow coma scale, and time to surgery could not be determined.

**Conclusions:** The literature suggests a rate of favorable recovery approaching 17% following decompressive surgery in patients with transtentorial herniation and BFDP, secondary to space-occupying lesions. In the setting of stroke or trauma, the clinical finding of BFDP should not be solely relied on as an indicator of futility. Prospective studies are warranted.

## Trauma

ePoster presentation

### Bilaterally fixed and dilated pupils are not the kiss of death in patients with transtentorial herniation: a single surgeon's experience

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**Objectives:** To present the outcomes of patients who presented with bilaterally fixed and dilated pupils and underwent life-saving decompressive surgery.

**Background:** Bilaterally fixed and dilated pupils in the setting of transtentorial herniation have traditionally been considered a sign of futility. Such patients are often denied life-saving surgery based on the premise that meaningful functional recovery would be extremely unlikely. We sought to determine the survival and functional outcome in a cohort of patients who underwent aggressive medical and surgical management.

**Methods:** Charts of all patients managed by a single surgeon over a 42-month period were retrospectively reviewed. Functional outcome was determined using modified Rankin Scale (mRS). Outcome was classified as good (mRS score 0-3), acceptable (mRS score 4), or poor (mRS score 5-6).

**Results:** Patients were 7 men and 2 women with a mean age of 36 years (range, 16-66 years). Etiologies included stroke (4 patients), traumatic brain injury (4 patients), and malignant cerebral edema (1 patient). Preoperative Glasgow Coma Scale scores ranged from 3 to 7, and midline shift was 7-16 mm. All patients received emergency osmotic therapy before decompressive surgery. Time to surgery (from pupillary changes) was <150 minutes for all patients (median 94 minutes; range, 50-148 minutes). At 3 months, 5 patients (55.6%) had recovered, achieving a good (n = 3) or acceptable (n = 2) outcome. The other 4 patients failed to recover and ultimately died of their injury.

**Conclusions:** In well-selected patients with transtentorial herniation and bilaterally fixed and dilated pupils, aggressive and timely medical and surgical management may lead to substantial rates of survival and favorable functional outcome. Preconceived notions of a universally grim prognosis in such patients can lead to self-fulfilling prophecies.

## Neurovascular Surgery

ePoster presentation

### Early Brain Injury and delayed cerebral ischemia after SAH

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**Objectives:** To describe the relation of Early Brain Injury and Cerebral Vasospasm.

**Background:** It is known as Early Brain Injury to the pathophysiological events that occur up to 72 hours after the rupture of the cerebral aneurysm.

After that period, we must consider the pathophysiological facts that classically fall within the concept of Cerebral Vasospasm.

**Methods:** The pathophysiology of early brain injury is described. After the rupture of the aneurysm, we have increase of ICP and decrease of CPP. First there is a Global cerebral hyperemia, this triggers a Global cerebral ischemia, with Trans-membranous Ionic alteration and Excitotoxicity, producing a global Cytotoxic edema. This induces a Microglial activation, Neuronal and endothelial damage, and we have a Vasogenic edema. Later, severe molecular alterations occur, with Oxidative Stress and Inflammatory Stress.

**Results:** Current Clinical Management of Early Brain Injury.

1st line: ICP control (< 20 mmHg), Cerebral Perfusion Pressure Optimization (>70 mmHg).

2nd line: Management of Cerebral Edema, Management of Hydrocephalus, Management of Intracranial Blood Load including Treatment of the Aneurysm.

Also, Targeted Temperature Management, Management of Neuroinflammation, Management of Cortical Spreading Depolarization and Seizures.

3rd line: Barbituric coma- Hypothermia- Decompressive Craniectomy.

EBI evolving to Cerebral Vasospasm.

In Cerebral Vasospasm we have two targets to proceed for the management:

1- at the Willis Circle: with arterial narrowing due to ultrastructural alterations,

2- at the microcirculation: where is presented the Delayed Cerebral Ischemia.

According with the Guidelines for the Management of Aneurysmal Subarachnoid Hemorrhage

1) Nimodipine should be administered to all patients with SAH.

2) Hemodynamic Therapy. SAH with disautoregulation the CBF is directly dependent of the CPP.

3) If the standard treatment using haemodynamic therapy and calcium antagonists fail, we should go to Angioplasty, mechanical and pharmacological.

**Conclusions:** Early Brain Injury is related with most severe Cerebral Vasospasm.

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## Neurovascular Surgery

Oral presentation

Blood blister like aneurysms - general considerations and management

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**Objectives:** To describe our experience treating 21 cases of Blood Blister like Aneurysms

**Background:** The dissection is caused by the entry of blood into the arterial wall with formation of an intramural hematoma, that progresses separating the parietal layers; may be located sub-intimal or between the media and adventitia (sub-adventitial). The first usually gives symptoms of obstruction of the lumen, the second produces subarachnoid hemorrhage at intracranial level.

**Methods: Etiopatogeny**

The blood blister like aneurysms may be generated due to:

- 1 - Acquired injury of the arterial wall as systemic Hypertension with lipohyalinosis and atherosclerosis with atheromatous ulcer
- 2 - Hemodynamic stress of the cerebral blood flow over areas with structural dysfunction of collagen

**Frequency**

0,3- 1% of intracranial aneurysms (Ohara& Suzuki)

**Location**

Superior wall of Internal carotid artery, M1 segment of the MCA, A1 segment of the ACA, V4 segment of the vertebral artery

**Clinical picture**

Posterior circulation: SAH predominant of posterior fossa subarachnoid space.

Anterior circulation : SAH related with dorsal ICA- extended parasellar SAH, frontal Intracerebral Hemorrhage.

**Results: Treatment**

Surgery and Endovascular Treatment

The surgery is limited especially to the cases presenting intracranial dissecting aneurysms with SAH.

The surgical techniques used are:

- proximal vessel ligation, or "Trapping" (associated or not with high flow "bypass")
- Wrapping with muscle tissue or silk material
- Resection of the aneurysm with arterial reconstruction.
- Clipping

**Conclusions:** The surgical techniques are detailed with figures at the presentation.

Recently, more works are published based on the concept of to repair endovascularly the dissected wall of the artery with stents and / or coils.

## Paediatric

ePoster presentation

### Strategies for Awake Brain Surgery in pediatric age: case report

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**Objectives:** To show feasibility for awake brain surgery in pediatric patients and define comprehensive strategies to minimize psychological distress during the procedure.

**Background:** Awake brain surgery (ABS) has emerged as a valuable technique in the neurosurgeon armamentum for the resection of brain tumors, enabling maximal safe resection guided by patient symptoms.

Although extensively described in adults, its utilization in pediatric patients is limited due to psychological considerations, including the unpredictable degree of cooperation during the procedure and potential psychological distress.

**Methods:** This is a retrospective review of a case treated in June 2022 at Centro Hospitalar Lisboa Central - Hospital de São José, Lisbon.

**Results:** We present the case of a 16-year-old girl with paroxysmal episodes of motor aphasia and right hemiparesthesia. MRI revealed a ganglioglioma in the left frontal insular region. The patient underwent left craniotomy with awake brain surgery, using cortical stimulation for resection guidance. The patient cooperated during the procedure without any complications.

She was discharged without neurological deficits and at one year follow-up showed no signs of recurrence. The steps undertaken to ensure minimal psychological distress and minimize complications are described in detail.

**Conclusions:** Our findings contribute to the growing evidence supporting ABS as a viable option for managing pediatric low grade gliomas in eloquent areas.

Furthermore, this case report highlights the importance of comprehensive strategies implemented to minimize psychological distress during the procedure in this age group.



## Global Neurosurgery

Oral presentation

Spontaneous intracerebral hemorrhage: clinical profile and natural history in a sub-Saharan country – a prospective and multicentric study

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**Objectives:** To analyze the clinical profile and natural history of patients with spontaneous intracerebral hemorrhage in 3 main tertiary Hospitals in Luanda – Angola.

**Background:** Stroke is a very common disease and well studied in the high-income countries been predominantly ischemic and in elderly patients. In African low-income countries there is initial evidence of Youngers patients and hemorrhagic strokes with a worse neurological outcome.

**Methods:** We Performed prospective multicentric cohort study, In the 3 main tertiary Hospitals in Luanda, capital of Angola. We included all patients with stroke from November 2022 to June 2023 and analyzed only those with spontaneous intracerebral hemorrhage. The follow up time was 90 days with neurological outcome evaluation using modified Rankin scale and Glasgow outcome scale on 30, 60 and 90 days of follow up, survival analysis was performed using Kaplan Meier curve, exclusion criteria were traumatic lesion, Subarachnoid hemorrhage, brain tumor and pediatric age.

**Results:** On final analysis 150 patients were included, 54% were female, mean age 51 years old and 56,6% were under 50 years old, main risk factor was arterial hypertension, main symptom was motor weakness, mean time of hospitalization was 14 days, there was a perfect positive correlation ( $R=0.8$ ) between hematoma volume and midline shift and also with mortality. On 30 days analysis mortality rate was 29% on discharge, 30% on 30<sup>th</sup> day, 38% on 60<sup>th</sup> and 48% on 90<sup>th</sup> day. There are not surgical patients in this study because in public health system in Angola, surgical treatment for hemorrhagic stroke is not performed, so this is the natural history of this disease in Angola.

**Conclusions:** Our results are alarming, a high mortality in very young patients reflecting a complete lack of control of risk factors for cerebrovascular diseases and inability to treat and follow up by the health system.

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## Skull Base

Oral presentation

Atlantoaxial fixation - is this the answer to Chiari dilemma?

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**Objectives:** To analyse the role of atlantoaxial fixation for Chiari formation.

**Background:** The subject of Chiari formation is revisited and redefined. Results of surgical treatment of patients with Chiari formation by atlantoaxial fixation are analyzed.

**Methods:** During the period June 2010 to December 2022, 474 patients with Chiari formation were treated by atlantoaxial fixation. No dural or neural decompression was done.

**Results:** Two hundred and sixty patients had no craniovertebral bone abnormality. 91 patients had group A and 123 patients had group B basilar invagination. Forty five patients had been earlier treated by foramen magnum decompression surgery with or without duroplasty. Clinical parameters, analysis of video recordings both before and after surgery, and patient self-assessment were included in the analysis of outcome. Immediate postoperative and sustained clinical improvement was observed in 471 patients.

**Conclusions:** Gratifying clinical outcome after atlantoaxial fixation and without any manipulation of neural structures, dura, or bone in the region of foramen magnum consolidates the viewpoint that atlantoaxial instability is the nodal point of pathogenesis of Chiari 1 formation. The analysis suggests that Chiari 1 formation may be a secondary natural neural alteration in the face of chronic atlantoaxial instability. The role of foramen magnum decompression surgery needs to be reassessed.

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## Skull Base

ePoster presentation

Cavernous sinus exenteration for managing a case of invasive cavernous sinus lesion

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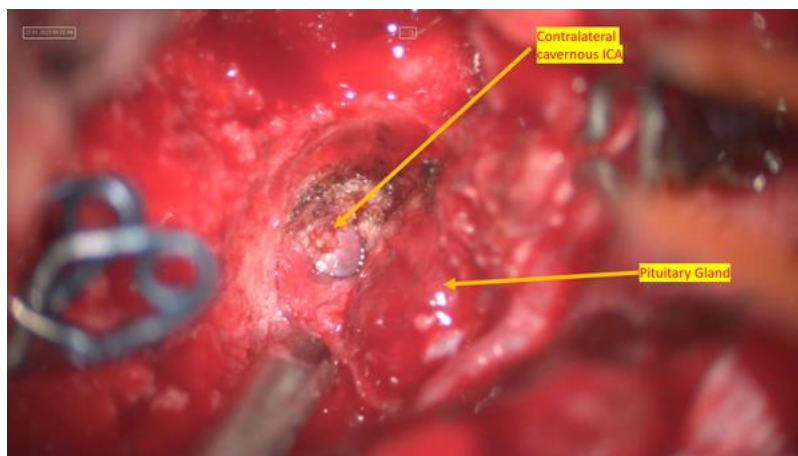
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**Objectives:** To assess postoperative outcome in a patient with cavernous sinus lesion when excision of cavernous sinus content along with tumour is supposed to produce no more neurodeficit.

**Background:** With advancement of microsurgical technique, so called no man's land, cavernous sinus is no longer no man's land. But due to invasiveness of pathologies like invasive meningioma, fungal infection, metastatic tumour, sarcoma, it is difficult to treat these lesions without creating new neurodeficit. Subtotal resection with adjuvant stereotactic radiosurgery remains treatment of choice. When neurodeficit is already established and stereotactic radiosurgery is difficult to avail, cavernous sinus exenteration may be done.

**Methods:** We have treated one case where cavernous sinus exenteration was done in January, 2023. 40 yr old male presented with left sided hemifacial pain and hyposthesia with global ophthalmoparesis. MRI of brain revealed homogeneously contrast enhancing lesion involving left cavernous sinus, sella, sphenoid sinus with extension to carotid canal & infratemporal fossa and perilesional brain edema. Preop CT angiogram showed codominant A1 ACA with absence of fetal pcom. Petrous ICA exposed by Glasscock triangle drilling and epidural ACP drilling done. After STA-M4 MCA double barrel bypass cavernous ICA trapped and blood flow checked in cortical vessels and in ophthalmic artery. Then gross total resection was achieved. Skull base was repaired in a standard fashion. Histopathology revealed anaplastic meningioma.



**Results:** No significant neurodeficit happened. Bypass was functioning properly.

**Conclusions:** Skull base microsurgery and microvascular anastomosis skill is required for cavernous sinus exenteration surgery and outcome is satisfactory.

## Neurovascular Surgery

Oral presentation

### Surgery for large and complex arteriovenous malformations

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**Objectives:** The role of surgery for large and complex arteriovenous malformations is analysed.

**Background:** The article analyzes the clinical features, morphological characteristics, surgical subtleties and long-term outcome of surgery in 89 cases of 'large' sized AVMs. Relevant literature on the subject is reviewed and analyzed.

**Methods:** During the period 2004 to 2022, 89 cases of 'large' arteriovenous malformations were operated in the neurosurgery departments of the authors. Large AVMs were defined as those that were more than 4 cm on either lateral or antero-posterior view of digital subtraction angiogram. The factors that determined the extent of surgical difficulties included site and eloquence of the area, number of feeding vascular territories and draining veins, degree and rate of flow, presence of flow-related aneurysms, and the physical nature of the arteriovenous malformation. The AVMs were graded into 4 categories based on the anticipated difficulties during surgery by the senior author into simple (Grade 1), difficult but possible (Grade 2), very difficult but possible (Grade 3) and impossible (Grade 4). All the AVMs included in this series were Grade 3.

**Results:** There were 59 males and 30 females and the average age was 32 years. Headache, giddiness and convulsions were the common presenting complaints. Six patients were unconscious after surgery. Of these, five patients died in the immediate post-operative period and one patient gradually recovered satisfactorily. Two patients were in altered sensorium before surgery but their sensorium recovered gradually following surgical excision of the AVM. Seven patients developed unilateral limb weakness that included hemiplegia (4 patients) and hemiparesis (3 patients) following surgery. Clinical follow-up ranged from 6 months to 18 years. All surviving patients are leading normal and essentially symptom free life.

**Conclusions:** Large AVMs are amenable to 'curative' surgery with 'acceptable' results. The surgery can be challenging and appropriate case selection is vital and decisive.

## Spine

Oral presentation

Central or axial atlantoaxial dislocation and craniovertebral junction alterations - a review of 393 cases treated over 12 years

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**Objectives:** The authors discuss the clinical entity of "central atlantoaxial dislocation".

**Background:** The authors review their scientific publications and updated their clinical material over the last 12 years where 'central or axial' atlantoaxial instability (CAAD) was identified in the presence of craniovertebral musculoskeletal and/or neural alteration/s. The management implication of diagnosing and treating CAAD is highlighted.

**Methods:** Three hundred and ninety three patients were diagnosed to have CAAD in the presence of craniovertebral junction related musculoskeletal and neural alterations and underwent atlantoaxial fixation. No bone decompression was done.

**Results:** The major radiological diagnosis was either singly or in cohort with one or more of other so-called 'pathological' entities that included Chiari formation (367 cases), syringomyelia with Chiari (306 cases), "idiopathic" syringomyelia (12 cases), Type B basilar invagination (147 cases), bifid arch of atlas (9 cases), assimilation of atlas (119 cases), C2-3 fusion (65 cases), Klippel Feil alteration (4 cases) and dorsal kyphoscoliosis (15 cases). The follow-up ranged from 6 to 155 months. Clinical improvement was observed in all patients.

**Conclusions:** Understanding and treating CAAD can have significant implication in the surgical treatment of a number of clinical entities. Gratifying clinical outcome following atlantoaxial fixation and without any kind of decompression that involved bone or soft tissue resection consolidates the concept that atlantoaxial instability has a defining role in the pathogenesis.

## Spine

ePoster presentation

'Only spinal fixation' as surgical treatment of cervical myelopathy related to Ossified Posterior Longitudinal Ligament. A review of 70 cases

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**Objectives:** The role of only fixation in the treatment of OPLL is analysed.

**Background:** Surgical management of OPLL and the choice of the most appropriate treatment is still a controversial issue. Here the authors report a series of OPLL-affected patients treated by 'only-fixation' technique.

**Methods:** Between June 2010 and June 2022, 70 patients having OPLL were treated by a surgical strategy involving only spinal fixation without any form of bone or soft tissue decompression. Facetal fixation for both atlantoaxial and subaxial spine formed the basis of the surgical treatment. Clinical parameters, analysis of video recordings both before and after surgery, and patient self-assessment were included in the analysis of outcome.

**Results:** During the mean follow-up period there was an immediate postoperative and progressive recovery in symptoms in 69 patients. All patients had successful arthrodesis in the surgically treated segments. There were no infective or implant related complications.

**Conclusions:** Spinal instability is the nodal point in the pathogenesis of OPLL. 'Only spinal fixation' without any form of decompression can be a rationale surgical treatment.

## Spine

Oral presentation

### Defining role of atlantoaxial and subaxial spinal instability in the pathogenesis of cervical spinal degeneration

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**Objectives:** The role of atlantoaxial and subaxial spinal instability as the nodal point of pathogenesis and focused target of surgical treatment is analyzed.

**Background:** The authors analyze their published work and update their experience with 374 cases of cervical radiculopathy and/or myelopathy related to spinal degeneration that includes OPLL.

**Methods:** During the period June 2012 to November 2022, 374 patients presented with acute or chronic symptoms that was attributed to degenerative cervical spondylotic changes or due to ossification of posterior longitudinal ligament (OPLL). There were 339 males and 35 females and their ages ranged from 39 to 77 years (average 62 years). All patients were treated for subaxial spinal stabilization by Camille's transarticular technique. Atlantoaxial stabilization was done in 128 cases by adopting direct atlantoaxial fixation in 55 cases or a modified technique of indirect atlantoaxial fixation in 73 patients. Decompression by laminectomy, laminoplasty, corpectomy, discectomy, osteophyte resection or manipulation of OPLL was not done in any case.

**Results:** During the follow-up period that ranged from 3 to 125 months (average 59 months) all patients had clinical improvement. Of 130 patients who had clinical evidences of severe myelopathy 116 patients walked aided (23 patients) or unaided (93 patients) at last follow-up. One patient in the series was operated 24 months after first surgery by anterior cervical route for 'adjacent segment' disc herniation. No other patient in the entire series needed any kind of repeat or additional surgery for persistent, recurrent or additional related symptoms. None of the screws at any level backed out or broke. There was no implant related infections.

**Conclusions:** Our successful experience with only spinal fixation without any kind of 'decompression' identifies the defining role of 'instability' in the pathogenesis of spinal degeneration and its related symptoms. OPLL appears to be secondary manifestation of chronic or longstanding spinal instability.

## Oncology

ePoster presentation

### Intraventricular craniopharyngiomas – institutional experience and a review of literature

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**Objectives:** To study the special features in clinical presentation, imaging and management of intraventricular craniopharyngiomas (IVCr).

**Background:** Craniopharyngiomas constitute 2–4% of intracranial neoplasms. IVCr are the rarely encountered varieties of these lesions. This study highlights the special features in clinical presentation, imaging, management, and surgical outcome of IVCr.

**Methods:** A retrospective analysis from two tertiary care institutions was performed. Medical records of histopathologically proven cases of IVCr from January 1994 to June 2021 were assessed, and images were analyzed based on the criteria by Migliore et al. for inclusion of solely intraventricular lesions having third ventricular ependyma demarcating it from the suprasellar cistern.

**Results:** Among the 25 patients included (mean age: 35.4 years), the most common presentation was headache (84%), vomiting and other features of raised ICP (72%), visual complaints (48%), and endocrinopathies (44%). Fifteen had predominantly cystic tumours, two were solid, and eight were mixed. Primary open microsurgical procedures were performed in 18 (72%) patients, of which four (16%) were endoscope-assisted. Seven (28%) underwent a purely endoscopic procedure. Complete excision was achieved in ten, near-total in nine, and partial excision in six. Four patients underwent a ventriculoperitoneal shunt (one before the definitive procedure). At a median follow-up of 36 months (range:11–147 months), five developed a recurrence, and one had a small stable residue. This patient and two others with small cystic recurrences were observed. One patient was managed with radiotherapy alone. Another underwent re-surgery after a trial of radiotherapy, and the last patient developed a local recurrence, which was managed with radiotherapy; he later developed an intraparenchymal recurrence, which was operated.

**Conclusions:** Purely IVCr present with raised intracranial pressure, and visual disturbances are less common. The proximity of the thalamus and hypothalamus makes complete excision difficult, especially when they are adherent. Close follow-up and radiotherapy remain important tools in the management armamentarium.



## Endovascular Neurosurgery

Oral presentation

Management of cervical internal carotid artery stenosis or occlusion in tandem lesion with acute ischemic stroke: PTA or stent?

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### Objectives:

We aimed to investigate the clinical and procedural results related to treatment management of the cICA lesion in tandem lesion and evaluate the risk factors for complications.

### Background:

An optimal treatment strategy of the cervical internal carotid artery (cICA) in tandem lesion, acute carotid artery stenting (CAS) or not, remains controversial.

### Methods:

Patients who underwent AMT for tandem lesion between January 2014 and June 2022 were included in this study. Treatment of the cICA lesion was classified into CAS group or non-CAS group. The clinical characteristic, radiological findings, complication, outcome was retrospectively examined in each group and the risk factors for postoperative ischemic events or symptomatic intracranial hemorrhage (sICH) were analyzed.

### Results:

Fifty patients with tandem lesions were treated. For treatment of the cICA lesions, CAS group included 36 (72%) and non-CAS group 14 (28%). No significant differences were found between CAS and non-CAS group with respect to age, gender, NIHSS, DWI-ASPECT score, site of intracranial vessel occlusion, cICA stenosis rate, and degree of calcification. Postoperative complications were observed in 9 (18%) patients. 5 (10%) had thromboembolic complications and 4 (8%) had sICH. Severe Calcification (OR9.85, 95% CI 1-96.6, p=0.04), non-CAS (OR14, 95% CI 1.4-139, p=0.018), and more than 60% residual stenosis after procedure (OR15.38, 95% CI 1.95-120.98, p=0.016) were significant risk factors associated with thromboembolic complications. sICH occurred in 4 (11%) of the CAS group but none in the non-CAS group. Of these 4 cases, more than 80% stenosis improvement was found in 3 (75%), which was significantly associated with sICH (OR 10.8, 95% CI 1.1-115.44, p=0.049).

### Conclusions:

It may be important to be careful not to overextend to reduce the risk of sICH. On the other hands, the cases of severe calcification of cICA non-CAS strategy may increase a risk of postoperative thromboembolic complications.

## Neurovascular Surgery

Oral presentation

A retrospective analysis of fifteen-year database of consecutive intracranial aneurysms: evaluation of 1450 aneurysms

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**Objectives:** We present the findings of a fifteen-year database of consecutive intracranial aneurysms, including risk factors, management, and patient outcomes. Our study focuses on estimating the rates of aneurysm rupture and the annual risk of rupture within a population of approximately 1 million individuals.

**Background:** There is a paucity in the literature regarding longitudinal follow-up, and management of cerebral aneurysms, particularly small size aneurysms.

**Methods:** Investigators captured intracranial aneurysm data at a single large tertiary neurosurgical center from 2007 to 2022. Data collected included size, morphology, imaging modality, rupture status and patient outcomes. Six independent authors verified the size and morphology of the aneurysms. Population data was used to estimate overall rate of rupture and risk of rupture under surveillance. Two statistical methods were used to estimate annual risk of rupture.

**Results:** 1450 aneurysms were identified, with 193 of them ruptured and 68 increased in size. 80 (41.4%) aneurysms were less than 7 mm at the time of rupture. 8 aneurysms ruptured while under surveillance, of these cases, 50% of patients did not survive. The overall estimated rupture rate was 1.37 per 100,000 patient years. The highest rate of rupture occurred in the age groups of 50-69 (3.28 – 4.14) while the lowest rate of rupture was in those aged 20-39 (0.11 – 0.23) and above 80 (1.67). The annual rate of rupture per patient year was 1.06% (Method 1) and 0.41% (Method 2), which is consistent with previous literature.

**Conclusions:** Our study demonstrated that current traditional parameters, such as size of the aneurysm, used to estimate the risk of rupture can be unreliable. Findings suggest that more frequent follow up is most appropriate for patients between 50 – 79 years of age. For patients over 80, less frequent follow up may be appropriate given low risk of rupture and likely concurrent age-related comorbidities.

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## Trauma

ePoster presentation

### Management of case of post-traumatic MCA dissection and Orbital Apex syndrome

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**Objectives:** To Assess Postoperative outcome of case of Post-traumatic Middle Cerebral Artery Dissection & Orbital apex syndrome.

**Background:** A 35y male who was presented to us with left sided hemiplegia, right sided blindness and complete ophthalmoplegia following RTA. CT scan revealed fractured right anterior clinoid process, fracture around superior orbital fissure, Intra cerebral haemorrhage around basal cistern and diencephalon. CTA revealed right MCA dissection.

**Methods:** We did decompression of superior Orbital Fissure & Optic Canal keeping fractured and dislodged ACP in situ. We also did right sided STA – MCA double barrel bypass to treat M1 MCA dissection.

**Results:** In immediate postoperative angiogram superior orbital fissure was well decompressed and double barrel STA MCA bypass was well functioning. In 3 month follow up patient can walk independently and ocular motility is well regained. Follow up angiogram revealed injured MCA is well healed.



**Conclusions:** Good postoperative outcome can be achieved in post-traumatic arterial dissection and fracture in and around superior orbital fissure.

## Spine

ePoster presentation

A clinical sign to differentiate discitis or failed back in patients with post operative pain following disc surgery

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### Objectives:

1. To report a clinical sign to differentiate whether a patient has discitis or recurrent disc in patients who have undergone Discectomy.
2. To test the sensitivity, specificity, positive predictive value and negative predictive value of the sign.

**Background:** Patient presenting in the OPD after discectomy is one of the most dreaded event . We had an increase of these incidents when we started practicing Endoscopic Discectomy. The differential diagnosis in this situation is discitis or failed back (residual disc, recurrent disc). To differentiate them , we did blood investigations (ESR, ASO titre and serum procalcitonin.) and MRI with STIR imaging

**Methods:** We noticed that patients having pain radiating to hip tend to be diagnosed as discitis and those who had pain radiating to lower limb were diagnosed to have failed back. Some patients had both hip and lower limb pain. They also tend to have discitis. Once this was identified, retrospectively data was collected from 2020. Also new patients who presented were also followed up prospectively.

**Results:** Of the 35 patients, 29 patients had pain radiating to hip. Of these 29, Discitis was confirmed by MRI and blood tests in 26 patients. Of the 6 patients who had only radicular pain, none had discitis. In the 29 patients with pain radiating to hip, 7 patients also had pain radiating to lower limb. The sensitivity of this test is 100%, specificity is 66.6%, positive predictive value is 89.65% and negative predictive value is 100%. Pathology is spasm of lower back muscles. Hence this pain can be relieved by muscle relaxants.

**Conclusions:** With 100% sensitivity, this clinical sign will help to make a quick clinical diagnosis of discitis and start treatment at the earliest.

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## Oncology

Oral presentation

Animal stereotactic device for preclinical research on tumor response after radiosurgery

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**Objectives:** A device for stereotactic radiosurgery capable of MRI in small animals was developed. The feasibility of creating a simulation treatment plan by means of small animal images was then assessed.

**Background:** In gamma knife radiosurgery, the tumor response to radiation is an important predictor of clinical treatment results. Since brain tumors have different characteristics and growth patterns, depending on the type, the tumors' response to radiation are also different. Compared with various other clinical treatments, there is a dearth of research on the development of gamma knife-magnetic resonance imaging (MRI) preclinical experimental equipment. Hence, the identification of preclinical equipment necessary for animals will provide meaningful data for the provision of clinical assistance to humans.

**Methods:** A device for stereotaxic surgery of small animals using a 48-channel MRI coil was developed using a 3D printer. Rat brain and abdominal MRI images were obtained with a 3T MRI scanner using a multi-channel coil. The acquired MRI images were transferred to GammaPlan and SurgiPlan workstations to establish a simulation treatment formulation.

**Results:** To irradiate gamma rays to the rat target site, an animal positioning device combined with a G-frame was mounted on a gamma knife irradiator. Planning of radiosurgery based on MRI images became possible with GammaPlan and SurgiPlan workstations.

**Conclusions:** Animal preclinical experiments are possible with the use of stereotaxic devices. In clinical treatment, preclinical experimental results will provide meaningful information.

## Neurovascular Surgery

ePoster presentation

### Experience of transcavernous approach for managing cases of basilar quadrifurcation aneurysms

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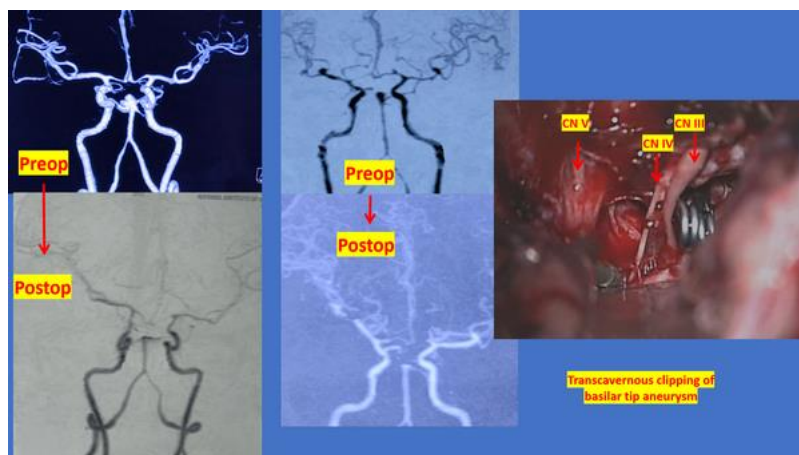
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**Objectives:** To assess effectiveness and outcome of transcavernous approach for clipping of basilar quadrifurcation aneurysm.

**Background:** Among all intracranial saccular aneurysms, microsurgical management of basilar quadrifurcation aneurysms is most critical. For normal or high riding basilar aneurysms FT OZ craniotomy and clipping of aneurysm via transylvian approach is our common practice. For low lying basilar aneurysms to get proximal control prior to aneurysm dissection is often cumbersome and make procedure risky.

**Methods:** We operated two cases where transcavernous approach was utilized. In this procedure we did fronto temporal craniotomy with zygomatic osteotomy, Extradural anterior clinoidectomy, epidural peeling and exposure of lateral wall of cavernous sinus. Cavernous sinus bleeding was controlled with flowseal and surgical. Dura was opened along skull base started from the level of meckels cave to optic nerve level, then dura was opened along sylvian fissure. Both CN III & IV were made free from dura of tentorium, oculomotor triangle and cavernous sinus wall. Posterior clinoid drilling was not required in either cases.

**Results:** After opening of lillequist membrane, through pretemporal carotico-oculomotor and widened oculo-tentorial, trochlear-tentorial triangle, proximal control of basilar artery was easily achievable and aneurysm were successfully clipped preserving perforators.



**Conclusions:** Transcavernous approach is an effective and technically demanding way to manage low lying basilar aneurysms.

## Oncology

ePoster presentation

### Neuromyelitis optica spectrum disorders mimicking multiple brain tumors

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**Objectives:** We report a rare case of neuromyelitis optica spectrum disorders (NMOSD), mimicking multiple brain tumors.

**Background:** Neuromyelitis optica spectrum disorders (NMOSD, previously known as neuromyelitis optica or Devic's syndrome) are rare autoimmune diseases involving the optic nerve, spinal cord, and central nervous system (CNS).

**Methods:** Upon admission, brain magnetic resonance imaging (MRI) showed about 10 multiple brain tumors, which had to be differentiated from multiple brain metastases, lymphoma, and high-grade glioma in both hemispheres. No primary cancer was found in the chest-abdomen-pelvis computed tomography. Subsequent spine MRI revealed multifocal cord signal change involving C2-T7, suggesting myelitis.

**Results:** A decrease in visual acuity was noted when taking a medical history, and optic neuritis was diagnosed upon ophthalmologic examination. With clinical and radiological appearances, multiple brain and spinal cord lesions have been diagnosed as NMOSD. Steroid and immunosuppressive drugs were administered. We should consider the possibility of an autoimmune disease, such as NMOSD, involving the optic nerve, spinal cord, and central nervous system when multiple hemispheric tumefactive lesions are observed.

**Conclusions:** We report a rare case of NMOSD mimicking multiple brain tumors. NMOSD should be considered in the differential diagnosis of multiple brain lesions in both hemispheres. Sufficient medical history and spine as well as brain MRI are essential in differentiating NMOSD from multiple brain tumors.

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## Spine

Oral presentation

Comparison between 3D-printed titanium and polyetheretherketone cages: 1-year outcome after minimally invasive transforaminal interbody fusion

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**Objectives:** Three-dimensional printed titanium implants have been developed recently, but the utility is not yet proven. The aim of this study was to compare 3D titanium and polyetheretherketone (PEEK) implants after minimally invasive transforaminal lumbar interbody fusion.

**Background:** 3D-printed titanium cages can be generated to reduce the modulus; they are produced with a rough surface and structure and an ideal perforated shape. These structures have similar properties to cancellous tissue and facilitate bone cell regrowth. Therefore, we compared the fusion rate and quality of fusion for 3D-printed titanium and PEEK cages.

**Methods:** Between October 2018 and September 2021, we retrospectively analyzed 83 patients who underwent single-level MIS-TLIF (40; 3D titanium, 43; PEEK). Radiologic parameters were assessed with X-ray and CT at postoperative 1 week, 6 months and 1 year. Clinical status was evaluated using ODI and VAS, and Bridwell fusion grading was assessed on 6-month and 1-year postoperative CT.

**Results:** There were no differences between the two groups in demographics and clinical outcomes. At 1 year of follow-up, the reported 3D titanium fusion grades were Grade I: 77.5% (31 patients), Grade II: 17.5% (7 patients), and Grade III: 5% (2 patients). The PEEK fusion grades were Grade I: 51.2% (22 patients), Grade II: 41.9% (18 patients), and Grade III: 7.0% (3 patients). For overall fusion rate (Grade I + II), there was no difference between the two cages (95.0% vs. 93.0%,  $p = 0.705$ ), but Grade I was reported at a higher incidence in 3D titanium than PEEK (77.5% vs. 51.2%,  $p = 0.013$ ). There was no difference between cages based on subsidence and complications.

**Conclusions:** There were no significant differences in the overall fusion rate for MIS TLIF surgery between 3D titanium and PEEK, but the fusion grade was better in 3D-printed titanium than in PEEK. Long-term follow-up is required to verify the effectiveness.



## Trauma

Oral presentation

### Prognostic factors on clinical outcome in patients with epidural hematoma - a systematic analysis in a large patient cohort

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**Objectives:** The aim of this large cohort study was to perform a systematic analysis on prognostic factors for patients with EDH.

**Background:** Patients with isolated epidural hematomas (EDH) are known to have favorable outcomes, however, neurological deterioration can occur rapidly and contributes to an increase in morbidity and mortality. Early diagnosis and, if indicated, neurosurgical evacuation of EDH is essential. Surgery is recommended for EDH >30cm<sup>3</sup> regardless of the GCS or if GCS <9. In the past several prognostic factors have been investigated, yet, the influence of duration from injury to surgery is inconsistent.

**Methods:** Adults patients admitted for management of an EDH between January 2011 and March 2022 were included. The patient records and CT scans were accessed electronically. Severity of TBI was classified as mild (GCS 13-15), moderate (GCS 9-12) and severe (GCS 3-8). The patients' outcome was determined by the Glasgow Outcome Scale Extended (GOS-E) at discharge.

**Results:** A favorable outcome was found in 85% of 225 patients and 51% suffered from mild TBI with a better outcome compared to moderate and severe TBI. Age and pupillary status had a clear impact on unfavorable outcome. Clot volume and thickness had no impact on outcome. More rapid surgery was performed in patients with severe TBI compared to mild TBI and clot volume, thickness and extent of midlineshift had a clear influence on the performance of early surgical clot evacuation.

**Conclusions:** Patients with isolated EDH who undergo safe and timely surgical evacuation often have a good prognosis. Our results show that neurological status at initial exam is the most important prognostic factors for a favorable outcome. Therefore, we emphasise the significance of the patients' neurological status for the indication of surgery. Size and thickness of the clot with concomitant midlineshift are essential for the indication of surgery and may indirectly influence patients' outcome.

## Spine

ePoster presentation

Utilizing tubular retractors to maximize minimally invasive lumbar decompression surgery in low and middle-income countries: a technique and feasibility study

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**Objectives:** We aim to describe our initial experience utilizing the Viseon MaxView camera system for MISS at Muhimbili Orthopedic Institute, highlighting this system's safety, feasibility, and applicability.

**Background:** Minimally invasive spinal surgery (MISS) offers better outcomes and quality of life than traditional methods. However, in low-and middle-income countries (LMICs) owing to limited knowledge and resources, such as a lack of access to endoscopes or microscopes, which are cumbersome, expensive, and require specific maintenance.

**Methods:** We report four cases of tubular over-the-top lumbar decompression using the Viseon Max camera system in a resource-constrained setting. The Viseon MaxView System is a novel visualization system that utilizes a miniature, single-use camera attached to a tubular retractor and projects 4K resolution images onto a head-up display. Data on the surgery duration, blood loss, perioperative complication, and technique mishap were collected. Short-term clinical outcome was also assessed using the visual analog scale (VAS) and the Oswestry disability index (ODI).

**Results:** Four patients, two male, and two females, with a mean age of 62 years, had severe radicular pain worse on the left and mild back pain. In addition, two patients had severe claudication, and another had a motor deficit, table 1. The duration of symptoms of the patients was, on average, 49 months. MRI showed disc prolapse or canal stenosis in the lumbar spine (L4-S1). All patients were obese with BMI >30kg/m<sup>2</sup>. All patients underwent tubular MISS with the Viseon system, Video 1, with a 60 or 70 mm tube size. The average duration of surgery was 146 min, with an average blood loss of 63mls. All patients were ambulant on the first-day post op with no post-op complications. The average time from admission to surgery was four days.

**Conclusions:** The Viseon MaxView camera system appears to be a feasible solution for MISS cases for patients in LMIC countries.

## Global Neurosurgery

ePoster presentation

Impact of the COVID-19 pandemic on neurosurgical procedure accessibility in the Brazilian public healthcare system: a 2020-2023 evaluation

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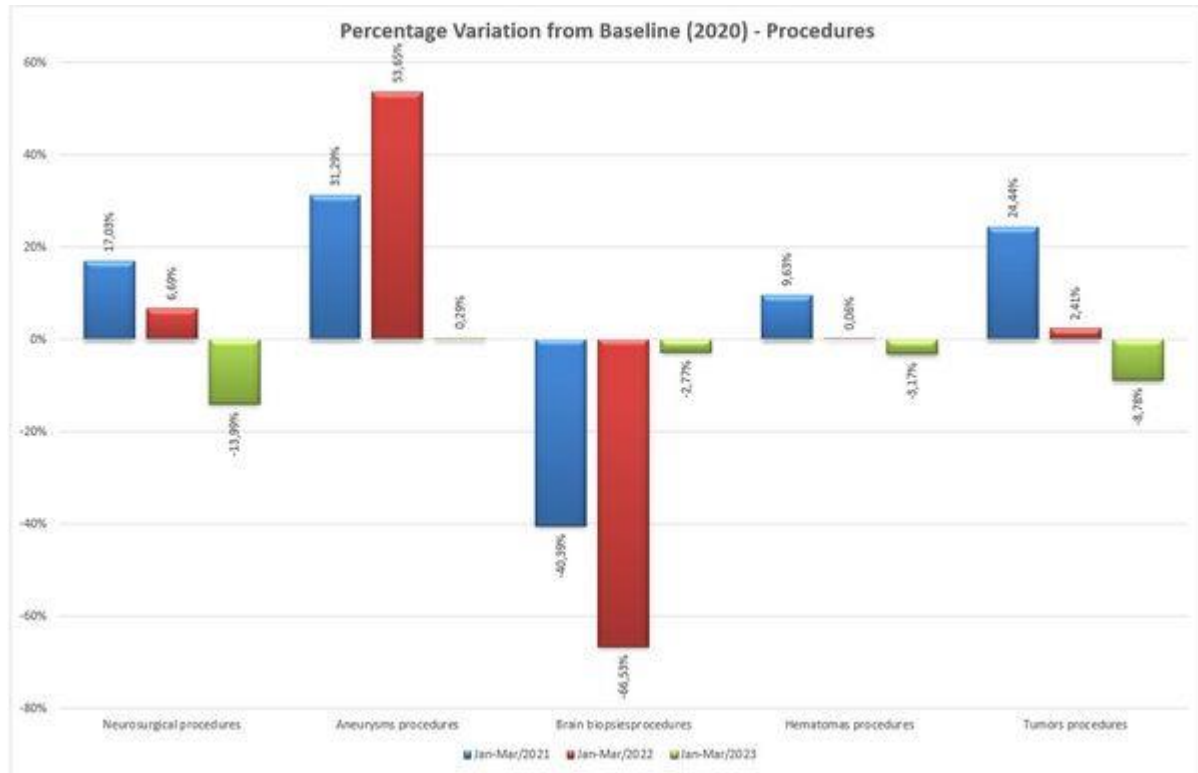
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**Objectives:** To assess the impact of the COVID-19 pandemic on the accessibility of neurosurgical-procedures in the SUS.

**Background:** The COVID-19 pandemic impacted healthcare systems worldwide. In Brazil, it spread rapidly, catching the healthcare system off-guard and bringing significant challenges to the SUS (Sistema Único de Saúde).

**Methods:** An analysis was conducted on 182 neurosurgical-procedures recorded in the Brazilian Hospital Information System within the DATASUS database. The data covered the period from January to March for the years 2020 to 2023. Linear-regression and paired t-test analyses were used, with statistical significance set at  $P < 0.05$ . Comparisons were made between the different time periods, using the data from 2020 as the baseline.

**Results:** The total number of identified procedures during the January-March period was 22,331 in 2020, 18,606 in 2021, 20,681 in 2022, and 22,913 in 2023. There was an overall decrease of 16.7% (3,705 cases) in all neurosurgical-procedures in 2021, followed by a recovery in procedure numbers in 2022 and 2023, with a decrease of 7.39% and an increase of 2.61%, respectively. The linear-regression analysis comparing the 4 time points did not demonstrate statistical significance, likely due to the limited number of periods assessed. However, the raw-data clearly showed a substantial reduction in procedure accessibility during the study periods. For brain-biopsies, the baseline was 83, with reductions of 30.1%, 25.3%, and 22.9% in 2021, 2022, and 2023, respectively. Surgeries for Syringomyelia and Chiari-I-malformation had a baseline of 37, with reductions of 51.35%, 24.32%, and 29.73% in 2021, 2022, and 2023, respectively. Surgical treatment of aneurysms had a baseline of 877, with decreases of 22.6%, 15.4%, and 15.3% in 2021, 2022, and 2023, respectively.



**Conclusions:** The COVID-19 pandemic substantially impacted access to neurosurgical-procedures in the Brazilian Public-Health-System, exacerbating existing challenges in meeting the population's demand for such treatments.

## Functional

Oral presentation

### Development of a stereotactic radiosurgery frame adapter for a multichannel MRI coil

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**Objectives:** To develop stereotactic radiosurgery (SRS) frame adapter for multi-channel MRI coil and verify the geometrical accuracy and signal-to-noise ratio (SNR) of MR images obtained using multi-channel MRI coil.

**Background:** The usage of multichannel brain magnetic resonance imaging (MRI) coils, which have several advantages over single-channel brain coils used for stereotactic radiosurgery (SRS), requires a frame adapter device to fit the frames inside the multichannel brain coils. However, such a frame adapter has not been developed until now.

**Methods:** SRS frame adapter for 48-channel MRI coil was designed and fabricated using 3D printer. The phantom and human brain MR images at 3T were obtained using multi-channel coils and single-channel coils. The CT phantom images were also obtained as a reference. To evaluate the geometrical accuracy, we compared the coordinate errors of the multi-channel coil and those of the single-channel coil. The coordinates were measured by two expert neurosurgeons. The SNR differences between the multi-channel coil and the single-channel coil were also compared for T1-weighted and T2-weighted brain images.

**Results:** For CT coordinate measurement, the correlation coefficient  $r=1$  and  $p<0.001$  in three axis ( $\Delta x$ ,  $\Delta y$ ,  $\Delta z$ ) and 3-dimensional error ( $\Delta r$ ) showed that there is no interpersonal difference between two neurosurgeons in measuring CT coordinates. The results from T1-weighted images showed that multi-channel coil had smaller coordinate errors in all three axis ( $\Delta x$ ,  $\Delta y$ ,  $\Delta z$ ) and 3D coordinate error ( $\Delta r$ ) than that of single-channel coil ( $p<0.001$ ). For SNR measurements, most brain areas showed higher SNR using the multi-channel than the single-channel coil in T1-weighted and T2-weighted images.

**Conclusions:** Compared to single-channel coil, the use of multi-channel MRI coil with newly developed frame adapter is expected to be useful for successful SRS with high geometrical accuracy and high SNR.

## Global Neurosurgery

ePoster presentation

Topical rifampicin for the management of reoccurring intracerebellar tuberculosis abscess: a case report

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**Objectives:** Study reports a patient who had mycobacterium tuberculous cerebellar abscess which was successfully treated with topical rifampicin.

**Background:** Intracranial abscess is a significant health burden in the public health sector. There is an increase in the incidence of cerebral abscess due to mycobacterium tuberculosis. Tuberculosis brain abscess occurs mostly in immunocompromised patients, highest in HIV infected patients. This study gives a report of a patient successfully treated for tuberculous brain abscess. It details the diagnostics test, imaging, medical and surgical interventions.

**Methods:** Radiological imaging was used to confirm the presence of fluid filled cavity in the cerebellum. Patient underwent surgical intervention to collect pus specimen. Specimen was sent for gram stain, Ziel-Neelson and microbiology culture. Gene expert and culture came back positive for rifampicin sensitive mycobacterium tuberculosis.

**Results:** Patient underwent surgical drainage of the abscess however experienced reaccumulation. Patient was also treated with anti TB medication. Last stage of the treatment involved instillation of rifampicin powder into the cerebellar abscess cavity. Patient had no reoccurrence after the instillation.

**Conclusions:** Tuberculous meningitis complicated by Intracranial abscess is a dilemma faced in the health sector. Patients can be diagnosed using conventional diagnostic tools and should receive the full course of anti tb medication. However, patients not responding to TB medication should be considered for intracranial instillation of rifampicin intraop.

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## Skull Base

ePoster presentation

Rathke's cleft cyst – minimally invasive surgical strategies

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**Objectives:** To understand various factors playing role in deciding the surgical approach for Rathke's cleft cyst (endonasal or transcranial).

**Background:** Rathke's cleft cyst is a cystic lesion located between the anterior and posterior lobes of the pituitary gland. Incidentally diagnosed lesions are usually asymptomatic and needs to be followed serially; whereas surgical intervention is recommended for symptomatic patients.

**Methods:** We discuss various factors playing role in deciding the surgical approach, and its likely outcome.

**Results:** Surgical approach for Rathke's cleft cyst (endonasal or transcranial) needs to be individualized based on cyst location. We discuss clinical features, radiology, surgical planning, and surgical videos of 3 case examples (two endoscopic and one transcranial).

**Conclusions:** An assessment of the relative benefits and potential pitfalls of different approaches based on cyst location is required in order to individualize surgical strategies for RCC.

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## Skull Base

ePoster presentation

Arrested pneumatization of the sphenoid sinus in the skull base

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**Objectives:** We report two cases of arrested pneumatization of the sphenoid sinus, a normal variant commonly misdiagnosed as a serious condition of the skull base.

**Background:** The sphenoid bones undergo fatty marrow conversion before the normal pneumatization occurs. In rare cases for no specific reason, the pneumatization fails before the respiratory mucosa fully extends into the site of fatty marrow conversion. In this case, atypical fatty marrow remains permanently around the sphenoid sinus even in adulthood, thus called arrested pneumatization.

**Methods:** Brain computed tomography and brain magnetic resonance imaging were used.

**Results:** In a non-expansile, non-eroded lesion with sclerotic margin, internal curvilinear calcification, and no destruction of surrounding structures on brain computed tomography (CT) of skull base, internal fat component on brain magnetic resonance imaging (MRI) is characteristic for diagnosis of arrested pneumatization. If the brain CT or MRI findings for this variant are not recognized, it is likely to be mistaken for a serious disease in the skull base.

**Conclusions:** We report rare two cases of arrested pneumatization prone to misdiagnosis for other skull base diseases leading to unnecessary examination or surgical biopsy or treatment.



## Global Neurosurgery

Oral presentation

Access to diagnosis through brain biopsies in the Brazilian Public-Health-System: an urgent call to improve accessibility

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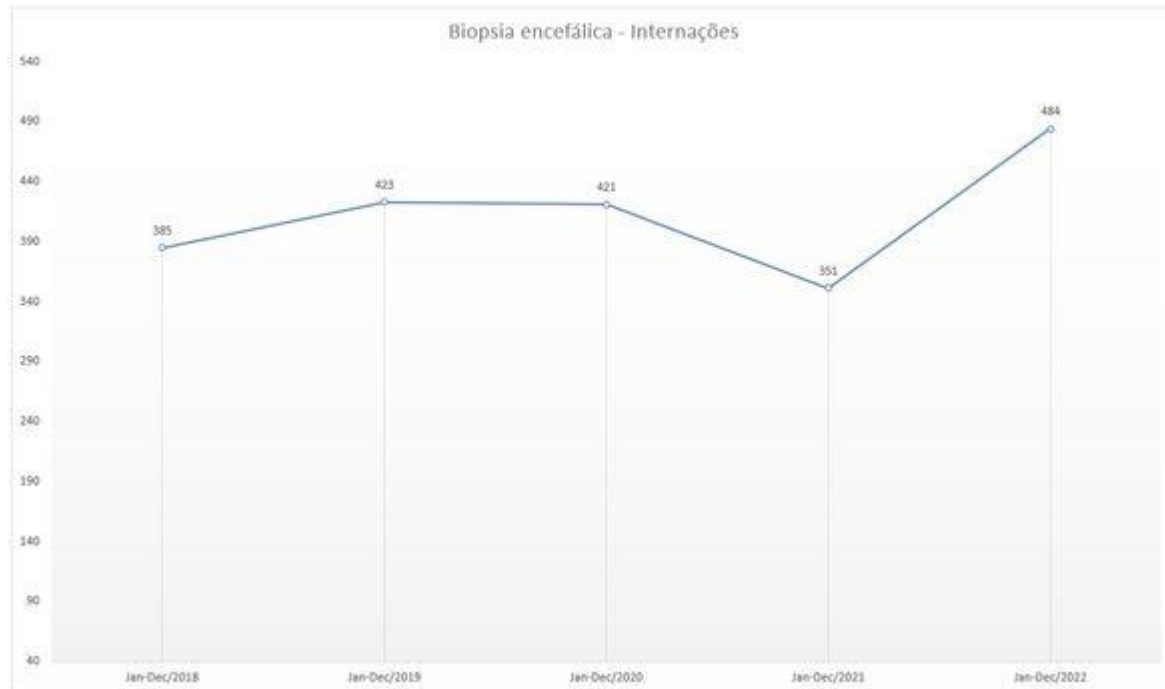
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**Objectives:** To assess the current accessibility of brain biopsies in the Brazilian Public-Health-System.

**Background:** Brain-biopsy is a critical neurosurgical-procedure conducted at specialized centers to obtain accurate and timely diagnoses for patients with brain tumors or non-neoplastic cryptogenic neurological diseases. Having access to timely and precise diagnoses is crucial in determining the appropriate treatment strategies for these conditions. In Brazil, patients heavily rely on the public healthcare system, with an estimated dependency-rate of over 75%.

**Methods:** An analysis was conducted on procedures recorded in the Brazilian Hospital Information System within the DATASUS database that describes the brain-biopsies performed throughout the country. The data covered the period from 2018 to 2022, separated by year.

**Results:** Two of the four evaluated procedures also encompass the punctures performed through trepanation, resulting in an overestimated data. The total number of procedures considered as brain-biopsies was 385 in 2018, 423 in 2019, 421 in 2020, 351 in 2021, and 484 in 2022. During the five-year evaluation period, a total of 2,064 biopsies were performed, resulting in an average of 34.24 biopsies per-month over the course of five years. These data encompass all procedures carried out nationwide within the Public-Healthcare-System during the studied periods. Taking into consideration the population of Brazil, which exceeds 215 million, and the fact that the SUS (Public-Health-System) caters to more than 190 million individuals, with approximately 75% of the Brazilian population relying exclusively on the public healthcare system, our findings suggest that patients in Brazil who depend on the Public-System for brain-biopsy related diagnoses are experiencing a lack of adequate support and access to necessary healthcare services.



**Conclusions:** It is imperative for Brazilian public institutions and political leaders to take immediate action and implement comprehensive initiatives to enhance access to diagnostic procedures that rely on intracerebral biopsies.

## Functional

ePoster presentation

### Experience of microvascular decompression for management of trigeminal neuralgia and hemifacial spasm

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**Objectives:** To assess immediate effectiveness of microvascular decompression for management of trigeminal neuralgia and hemifacial spasm.

**Background:** Both trigeminal neuralgia and hemifacial spasm are debilitating pathology that hampers patients day to day life to a great extent. In selected patients where medical management were not successful enough and patient having good general physical condition with more than 5 yr life expectancy, MVD is a good alternative.

**Methods:** We did microvascular decompression in five cases, one in hemifacial spasm and four in trigeminal neuralgia. Through retromastoid retrosigmoid craniotomy neurovascular conflicts were addressed.

**Results:** In hemifacial spasm case, offending vessel was an artery which was a common AICA -PICA that divides below root exit zone of CN VII and PICA was encircling the VII-VIII complex. In trigeminal neuralgia case SCA and veins were found as offending vessels. Muscle patch was used as insulator. Symptomatic improvement achieved in all cases without any major complication.

**Conclusions:** MVD is preferable option for management of trigeminal neuralgia and hemifacial spasm.

## Global Neurosurgery

ePoster presentation

Post-pandemic response of the Brazilian Public Healthcare System in the field of neurosurgery

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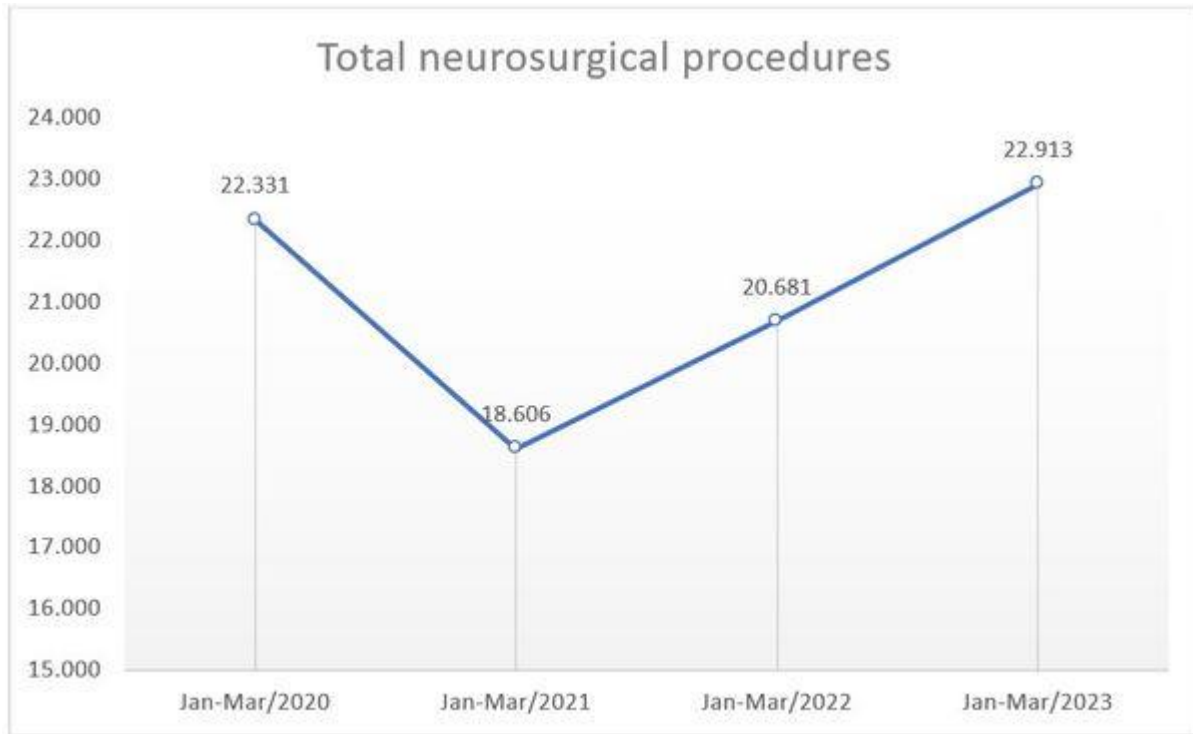
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**Objectives:** To assess the response of the Brazilian Health System to the COVID-19 pandemic on the accessibility of neurosurgical procedures in the SUS.

**Background:** In Brazil, the COVID-19 pandemic it spread rapidly, catching the healthcare system off guard and bringing significant challenges to the SUS (Sistema Único de Saúde).

**Methods:** An analysis was conducted on 182 neurosurgical-procedures recorded in the Brazilian-Hospital-Information-System within the DATASUS database. The data covered the period from January to March for the years 2020 to 2023. Linear-regression and paired t-test analyses were used, with statistical significance set at  $P < 0.05$ . Comparisons were made between the different time periods, using the data from 2020 as the baseline.

**Results:** The total number of identified procedures during the January-March period was 22,331 in 2020, 18,606 in 2021, 20,681 in 2022, and 22,913 in 2023. There was an overall decrease of 16.7% (3,705 cases) in all procedures in 2021, followed by a recovery in numbers in 2022 and 2023, with a decrease of 7.39% and an increase of 2.61%, respectively. The linear-regression analysis comparing the 4 time points did not demonstrate statistical significance, likely due to the limited number of periods assessed. However, the raw-data clearly demonstrated a significant decrease followed by a subsequent increase in the number of procedures performed. Furthermore, the mortality rate in 2020 was 8.22%, in 2021 9.62%, in 2022 8.77%, and in 2023 7.07%. The total number of surgeries and the mortality-rate displayed their worst numbers in 2021, coinciding with the peak of the pandemic in Brazil (March-2021). However, the Healthcare-System responded positively in the post-pandemic period, with an increase in the number of procedures and a considerable decrease in the mortality-rate.



**Conclusions:** The neurosurgical-related scenario in the Brazilian-Public-Health-System showed a recovery in both the number of procedures and the mortality-rate.

## Functional

ePoster presentation

Stromal vascular fraction in neurodegenerative disorders, traumatic brain and spinal cord injuries: a systematic review of pre-clinical in vivo studies

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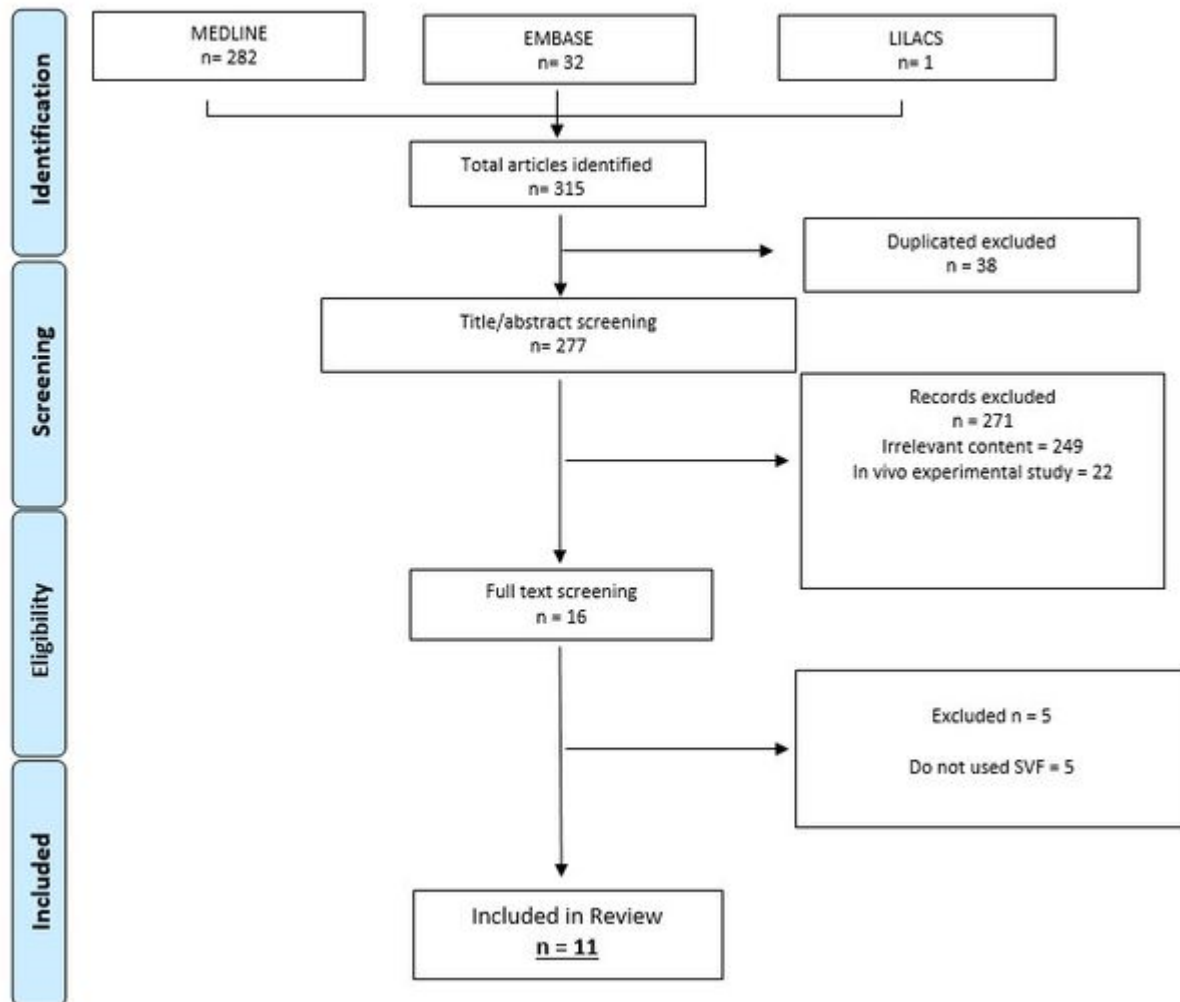
**Objectives:** To evaluate the safety, efficacy and scenario of in vivo experimental use of SVF in Neurodegenerative and Central Nervous System Diseases.

**Background:** The therapeutic potential of the stromal vascular fraction (SVF) has been widely studied in various pre-clinical investigations, including neurodegenerative diseases, although its mechanism of action remains unclear.

**Methods:** This systematic review adhered to the PRISMA guidelines and included studies without language or publication date restrictions up until May 29th, 2023, in the MEDLINE, LILACS, and EMBASE databases. Studies were included if they were experimental in-vivo studies that used enzymatically extracted SVF for neurodegenerative-diseases, traumatic brain and spinal-cord injuries.

**Results:** A total of 315 articles were found, and 11 articles/abstracts, 7 and 4 respectively, were selected after reading the titles and abstracts, removing duplicates and full text screening. Six therapeutical applications were identified: Multiple-Sclerosis, Traumatic Brain Injurie (TBI), Traumatic Spinal-Cord Injurie (tSCI), Sciatic Nerve Degeneration, Hemorrhagic Stroke, and Autoimmune Encephalomyelitis. Ten studies used rats and one cats, and six studies were from USA, two from Iran, and one from each one: France, Egypt or Vietnam. Applications were done intrathecally, intraperitoneally, intravenously, peri-neurally, and in the lesion of the tSCI and hemorrhagic stroke. All studies reported marked benefits and safety, without any adverse event reported. One study reported that in a contusion induced paraplegic rats the SVF promoted locomotory recover.

## PRISMA 2009 Flow Diagram



**Conclusions:** The findings identified through this review reinforce the regenerative, anti-inflammatory, and immunomodulatory potential of SVF, providing preclinical evidence for its therapeutic use in pathologies for which there are currently no established treatments capable of curing these diseases. Multiple-sclerosis, sequela of Hemorrhagic-Stroke, tSCI, and TBI are diseases that urgently require efficient therapies, and regenerative-medicine utilizing SVF represents a promising therapeutic possibility. Preclinical and clinical studies are warranted to further explore the potential of SVF.

## Spine

ePoster presentation

Acupuncture-like-tens quantitative-measure for feasibility of intrathecal-sodium nitroprusside superfusion in paraplegics for physiological recovery via 10000-fold effect in 72 cases

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**Objectives:** To prognosticate the POST-ITSNP effect by AL-TENS in Thoracolumbarsacral paraplegia cases, Prospective-study.

**Background:** Intrathecal sodium Nitroprusside (ITSNP) has shown marked recovery in various causes of paraplegias after proper surgical decompression of spinal cord and stabilization of vertebra. Until now we were unable to the measure of paraplegias' recovery bedside effectively, either by clinical or SSEP and MEP. We present our work for prediction for paraplegics using ACUPUNCTURE-LIKE TENS (AL-TENS) with ITSNP in various thoracolumbarsacral cases.

AL-TENS caused pain relief by well known gate theory at spinal cord by activating A-ALPHA nerve fibers which activates A-DELTA fibers for muscle spindle then pain fibers are inhibited by RENSCHAW cells at spinal cord. The present work uses this cascade of various transmissions of nerves via a normal or damaged (complete or partial) spinal cord.

**Methods:** 72 paraplegia patients (50 male patients and 12 females, 10 complete paraplegia and 62 partial paraplegias with ZPP (zone of partial preservation) cases taken in which PREITSNP AL-TENS and POSTITSNP TENS have been done. The mean time for superfusion was 9.69 months. ITSNP was administered at a dosage of 0.2 mg/kg body weight at L3/4 level by 20G LP needle. Pre and post-ITSNP was monitored by AL-TENS.

**Results:** POST-ITSNP AL-TENS showed 23.84% benefit overall and 23.32% in ASIA grading in thoracolumbarsacral paraplegia cases. Complete paraplegia cases didn't show any change while partial paraplegias (with ZPP) showed 31% recovery in POST-ITSNP TENS and 33.34% in ASIA grading. Thus AL-TENS showed a favorable modality to predict the ITSNP feasibility in thoracolumbarsacral paraplegia cases. If PRE-ITSNP TENS showed 8 mAmp or more there will be no response to ITSNP.

**Conclusions:** AL-TENS helps us to prognosticate the future outcome FOR ITSNP in paraplegia cases.



## Functional

ePoster presentation

### Safety, therapeutical potential and future perspectives of stromal vascular fraction in neurodegenerative disorders: a systematic review

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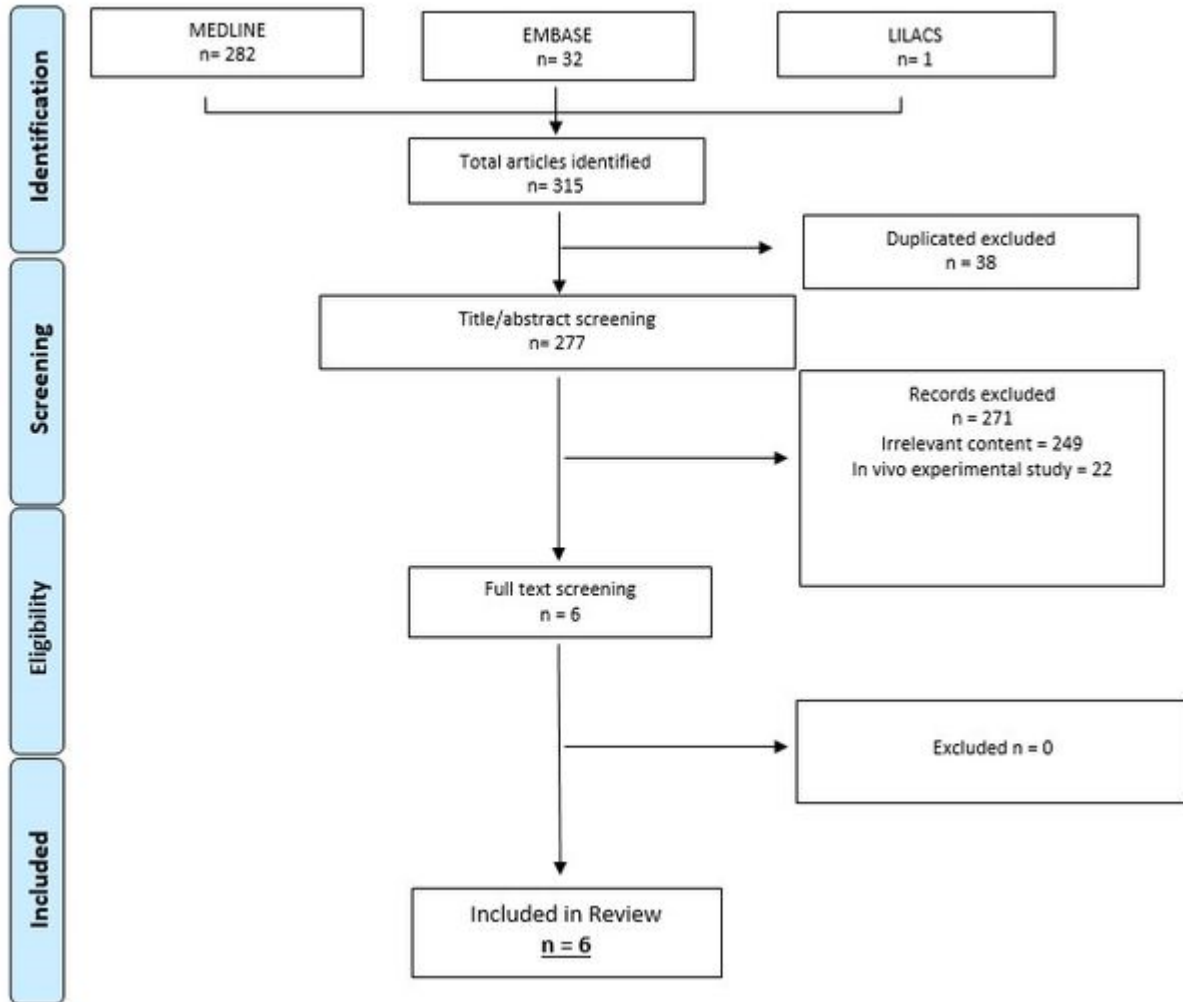
**Objectives:** To evaluate the safety, efficacy and scenario of clinical use of SVF in Neurodegenerative Disorders.

**Background:** The therapeutic potential of the stromal vascular fraction (SVF) has been widely studied in various areas, including neurodegenerative diseases, although its mechanism of action remains unclear.

**Methods:** This systematic review adhered to the PRISMA guidelines and included studies without language or publication date restrictions up until May 29th, 2023, in the MEDLINE, LILACS, and EMBASE databases. The level of evidence in the studies was assessed using the GRADE system. Studies were included if they were clinical trials, prospective and retrospective cohorts, case-series or case-reports, only in humans and that used enzymatically extracted SVF for neurodegenerative diseases.

**Results:** A total of 315 articles were found, and 6 articles were selected after reading the titles and abstracts, removing duplicates, and conducting full text screening. A total of 73 patients and 7 different therapeutic objectives were identified, with two adverse events reported. The most patients were treated for multiple sclerosis (n=42), followed by Alzheimer's (n=10), Parkinson's Disease (n=8), amyotrophic lateral sclerosis (n=6), stroke rehabilitation (n=5), 1 spinal cord injury, and 1 traumatic brain injury. The predominant route of administration in the included studies was Intrathecal (n=36), followed by Intracerebro-ventricular (n=31), intramuscular (n=3), peri-fascial (n=2), and 1 intravenous. Most studies reported clinical benefits, except one that focused solely on laboratory benefits (inflammatory markers). There were 3 case reports, 2 prospective cohorts, and 1 clinical trial, all classified as low evidence level according to the GRADE system.

## PRISMA 2009 Flow Diagram



**Conclusions:** There is scientific evidence, although with a low level of evidence, demonstrating the safety and therapeutic potential of using SVF in neurodegenerative diseases. However, further clinical studies are imperative to gain a more comprehensive understanding and fully explore its therapeutic potential.

## Endovascular Neurosurgery

ePoster presentation

Acupuncture-Like-Tens (Al-Tens) as quantitative-measure for the feasibility of intracarotid sodium nitroprusside injection in subacute-ischemic-stroke for physiological-recovery via 10000-fold effect-60 cases

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**Objectives:** To prognosticate the POST-IASNP effect by AL-TENS in SUBACUTE ISCHEMIC STROKE (SIS) cases, Prospective-study.

**Background:** Intrathecal sodium Nitroprusside (ITSNP) has shown marked recovery in various causes of ACUTE ISCHEMIC STROKE CASES previously when it SNP was given intra-arterial (INTRA CAROTID-IASNP). Until now we were unable to measure the recovery bedside effectively before IASNP. We present our work for prediction for prognosis of IASNP in SUBACUTE ISCHEMIC STROKE (SIS) cases (from 5<sup>th</sup> day to 21<sup>st</sup> day post ischemia time) using ACUPUNCTURE-LIKE TENS (AL-TENS).

AL-TENS caused pain relief by well known gate theory at spinal cord by activating A-ALPHA nerve fibers which activates A-DELTA fibers for muscle spindle then pain fibers are inhibited by RENSCHAW cells at spinal cord. The present work uses this cascade of various transmissions of nerves to prognosticate the IASNP effect in these chronic ischemic stroke cases.

**Methods:** 60 SIS patients (from 5<sup>th</sup> day to 21<sup>st</sup> day post-ischemia time), {50 male patients and 10 females. The mean time for reperfusion was 6.29 DAYS. IASNP was administered at a dosage of 0.02 mg/kg bo wt at IPSILATERAL CAROTID ARTERY by 20G VIGGO. Pre and post-IASNP were monitored by AL-TENS, clinical NIHSS gradings and MRA/DWI/PWI/fMRI, and PRE AND POST IASNP VIDEO RECORDINGS of CLINICAL BENEFITS.

**Results:** POST-IASNP AL-TENS showed 42.84% benefit overall and 55.32% in NIHSS grading in SIS cases. Complete ISCHEMIC STROKE cases didn't show any change while partial ISCHEMIC STROKE (MRA/DWI/PWI/fMRI showing partial perfusion) showed 71% recovery in POST-IASNP TENS and 53.34% in NIHSS grading. Thus AL-TENS showed a favorable modality to predict the IASNP feasibility in PARTIAL SIS cases. If PRE-IASNP TENS showed 8 mAmp or more there will be no response to IASNP.

**Conclusions:** AL-TENS helps us to prognosticate the future outcome FOR IASNP in PARTIAL ISCHEMIC STROKE.

## Trauma

ePoster presentation

### Low arterial oxygen saturation predicts poor outcome in patients with epidural hematoma

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**Objectives:** To assess the prognostic role of oxygen saturation (SpO<sub>2</sub>) on hospital arrival in patients with epidural hematoma. To evaluate the reliability of oxygen saturation (SpO<sub>2</sub>) when compared to GCS scores on mortality risk among patients with epidural hematoma.

**Background:** Glasgow Coma Scale (GCS) remains the predominant measure in neurological assessment and classification of trauma severity in patients with epidural hematoma. The use of SpO<sub>2</sub> on hospital arrival has been proposed as a prognostic indicator for patients with traumatic brain injuries, though its prognostic role in epidural hematomas has yet to be fully explored.

**Methods:** The National Trauma Data Bank was queried from 2017-2019 for all patients with epidural hematomas requiring decompressive craniectomy. Patients were stratified based on oxygen saturation upon hospital arrival: normal (95-100%), moderately low (90-95%), low (80-90%), severely low (70-80%), and critically low (<70%). A logistic regression model was developed to assess the effect of oxygen saturation and other covariates on the risk of mortality.

**Results:** A total of 30,755 patients met the inclusion criteria. Moderately low (OR=1.51, p<0.001) and low (OR=1.37, p=0.02) SpO<sub>2</sub> were both associated with increased odds of mortality, but severely low and critically low SpO<sub>2</sub> were not. Severe GCS (<8) was the strongest risk factor for death (OR=12.82, p<0.001), followed by penetrating injury mechanism (OR=3.86, p<0.001), moderate GCS (9-12; OR=3.75, p<0.001), and the presence of an advanced directive limiting care (OR=3.11, p<0.001).

**Table 1.** Oxygen saturation and other covariates risk factors for mortality

Variable	Odds Ratio (95% CI)	P-Value
Severe GCS (<8)	12.82 (10.97-14.99)	<0.001*
Penetrating Injury Mechanism	3.86 (2.79-5.35)	<0.001*
Moderate GCS (9-12)	3.75 (2.97-4.73)	<0.001*
Advanced Directive Limiting Care	3.11 (2.33-4.16)	<0.001*
Kidney Disease	2.50 (1.59-3.91)	<0.001*
Disseminated Cancer	2.47 (1.22-5.00)	0.01*
Insurance Medicare	2.34 (1.60-3.42)	<0.001*
Cirrhosis	1.82 (1.10-3.01)	0.02*
Self Inflicting Injury Mechanism	1.81 (1.24-2.65)	<0.01*
Bleeding Disorder	1.67 (1.10-2.55)	0.02*
Anticoagulant Use	1.64 (1.27-2.11)	<0.001*
Moderately low SpO2	1.51 (1.25-1.83)	<0.001*
Hypertension	1.42 (1.19-1.70)	<0.001*
COPD	1.41 (1.02-1.93)	0.04*
Asian	1.38 (1.02-1.85)	0.04*
Low SpO2	1.37 (1.04-1.80)	0.02*
Craniectomy	1.34 (1.06-1.69)	0.01*
Injury Severity Score	1.04 (1.03-1.04)	<0.001*
Mental/ Personality Disorder	0.74 (0.58-0.94)	0.01*
Smoking	0.65 (0.54-0.79)	<0.001*
Substance Abuse Disorder	0.60 (0.45-0.78)	<0.001*

**Conclusions:** In patients with epidural hematoma, moderately low and low SpO2 are prognostic factors for mortality. However, moderate and severe GCS scores and penetrating injury mechanisms show stronger associations with the risk of mortality. Providers may rely on oxygen saturation in patients with SpO2 of 80-95% for mortality assessment when GCS scores are unavailable for immediate use. However, GCS scores should remain the predominant prognostic indicator.

## Neurovascular Surgery

ePoster presentation

Ruptured intracranial aneurysm in a patient with osteogenesis imperfecta: literature review and case report

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**Objectives:** This paper aims to review the literature on the relationship between intracranial hemorrhage and osteogenesis imperfecta and report a case of subarachnoid hemorrhage after anterior communicating artery aneurysm (ACommA) rupture.

**Background:** Osteogenesis imperfecta (OI) is a genetic disorders that affects connective tissue, type I collagen architecture, and impairs bone structure, making it fragile and causing deformities. Blood vessels can also be affected and cerebral vascular structures may also be involved, increasing the chances of developing cerebral hemorrhages, for example.

**Methods:** In order to investigate cases in the literature, a search was conducted in the MEDLINE/PUBMED using the following descriptors: ((osteogenesis imperfecta[Title/Abstract]) AND (intracranial aneurysm[Title/Abstract] OR cerebral aneurysm[Title/Abstract])) OR ((osteogenesis imperfecta[Title/Abstract]) AND (hemorrhage[Title/Abstract]))

**Results:** A 55 years old female patient, with OI with history of traumatic brain injury 30 years ago, referred from another service, complained of holocranial headache graded 10/10, nausea and vomiting. Brain computed angiotomography showed modified Fisher scale grade 1 subarachnoid hemorrhage due to ACommA aneurysm. Patient underwent surgery for clipping the aneurysm 14 days after the onset, without intraoperative complications. Concerning the literature, 44 papers were found between 1975 and 2023, but after review, only 12 were selected for the study. Patients with OI who reported subarachnoid hemorrhage had a mean age of 42.3 years; all patients had previous traumatic events; median Fisher scale grade was 3.5; 8 aneurysms were located anteriorly and 4 posteriorly. A recent review revealed that unruptured aneurysm (UA) were found in 21% of patients with OI, higher than the

prevalence of UA in general population.

Paper	Patient N.	Aneurysm N.	Sex / Age	Ruptured	Modified Fisher Scale	WTN S grade	Hunt-Hess Scale	Size	Location	Mutated Gene	OI Type	Treatment Option	Need for shunt	Delayed cerebral ischemia	Outcome
Okamura et al., 1995	1	1	F / 33	Yes	NA	NA	NA	NA	Sacular A.Comma	NA	I	Clipping	No	No	Good
Nervaez et al., 1996	2	2	F / 22	Yes	NA	I	II	NA	Sacular A.C.prona	NA	I	Clipping	No	No	Good
Havlik and Nashehikg, 2001	3	3	M / 38	Yes	NA	NA	NA	Bifurcations	Sacular A.Comma	NA	IV	NA	NA	NA	Death
Petruccioli et al., 2007	4	4	M / 44	Yes	NA	3	3	NA	sacular basilar	SNP of exon 28 of the gene encoding for alpha-2 polypeptide of collagen I	NA (IV)	Coil embolization	No	No	Good
Kallaperumal et al., 2011	5	5	M / 53	Yes	4	4	4	NA	right fusiform VA	NA	I	stent assisted coiling	Yes	Yes	Severe disability
Mantouk et al., 2011	6	6	M / 49	Yes	3	4	5	NA	right dissecting superior cerebellar artery	NA	NA (IV)	coil embolization with intentional parent vessel sacrifice	Yes	No	Good
Hirohata et al., 2014	7	7	F / 37	Yes	3	2	3	NA	right MCA M2 dissecting proximal left ICA	No mutation	I	Clipping	No	No	Good
Mansfield and Rahme, 2015	8	8	F / 50	Yes	4	5	5	4.0mm	right Pcomin	NA	I	Clip-reconstruction	Yes	Yes	Death
Gabriel et al., 2016	9	9	F / 50	Yes	4	4	4	NA	left MCA M1/bifurcation	NA	I	Coiling	Yes	Yes	Good
	10	11	F / 50	Yes	NA	>3	>3	NA	right Pcomin	NA	I	No treatment	NA	NA	Death
Kato et al., 2017	11	12	F / 32	Yes	3	5	5	NA	left dissecting VA	NA	I	Conservative	No	No	Death
Sandana et al., 2017	12	13	F / 50	Yes	4, right frontal hemorrhage	3	3	NA	M1 MCA bifurcation: sacular - right one	NA	I	Advice about neurointervention, but not clear	No	No	Good
		14		No	4, right frontal hemorrhage	NA	NA	NA	M1 MCA bifurcation: sacular mirror - left one	NA	I	Advice about neurointervention, but not clear	No	No	Good
Mitsuhiro et al. 2021	13	15	F / 73	No	-	-	0	4.2mm	right ICA C2	Novel heterozygous variant in COL1A3 (p.Gly1032Cys)	I	Conservative	NA	NA	NA
	14	16	M / 43	No	-	-	0	2.7mm	left ACA A2	variant in COL1A2 (p.Gly772Ser)	IV	Conservative	NA	NA	NA
	15	17	F / 35	No	-	-	0	3.0mm	right Pcomin	NA	III	Conservative	NA	NA	NA

**Conclusions:** There is a plausible biological association between OI and intracranial hemorrhage and a higher prevalence of UA in OI reinforces the concern for screening patients with OI for aneurysms, with the aim of achieving a better prognosis for this population.

## Oncology

ePoster presentation

### Unusual presentation of astrocytoma (WHO II): a case report and systematic review

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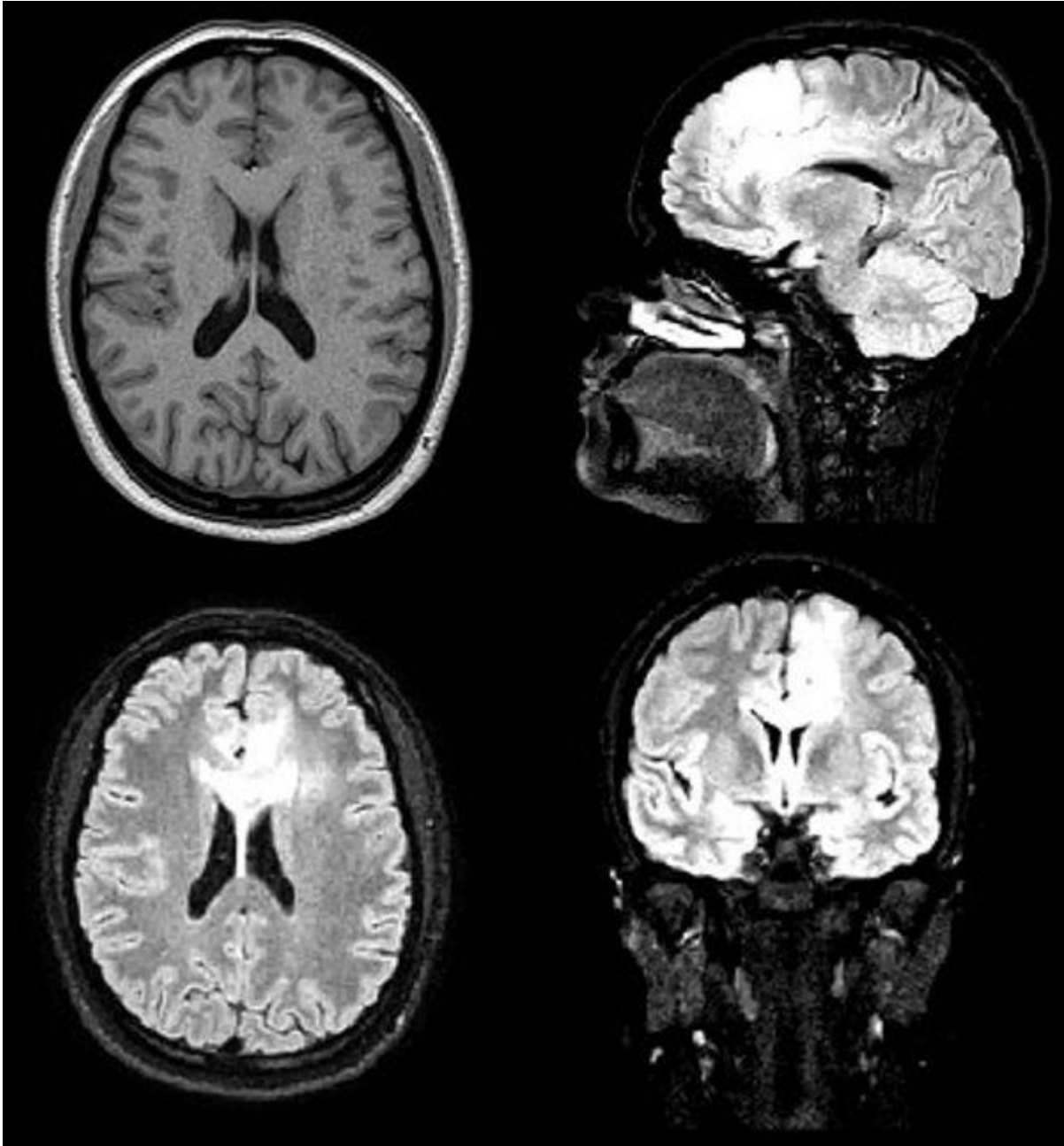
**Objectives:** To describe an unusual case of Astrocytoma that invaded the corpus-callosum, and to evaluate the current literature on low-grade astrocytomas that cross the midline.

**Background:** Low-grade astrocytomas usually do not cross the midline and invade the corpus-callosum as observed in Glioblastoma.

**Methods:** This is a case-report that followed the CARE-Checklist reporting guidelines and a Systematic-Review adhered to the PRISMA-guidelines. The review searched for studies, without language/publication-date restrictions, up until May 29<sup>th</sup>, 2023, in MEDLINE, LILACS, and EMBASE, reporting low-grade gliomas crossing the midline.

**Results:** A 27-year-old woman presented at the emergency room with complaints of visual blurring. Upon physical examination, she exhibited papilledema, and a CT-scan was performed, but it was not sufficient to elucidate the case. An MRI-image revealed an expansive mass in the left frontal-lobe that extended through the corpus-callosum to reach the contralateral hemisphere, but it did not demonstrate contrast-uptake. The MRI exhibited features that are typically associated with both low-grade astrocytomas and high-grade astrocytomas. The lesion was not large enough to explain the intracranial hypertension demonstrated by the papilledema, and the patient reported close contact with two family members undergoing treatment for tuberculosis, as well as a positive PPD-test, thus raising the hypothesis of tuberculosis-related corpus-callosum lesion. A lumbar-puncture was performed, which showed an intracranial pressure of 50 mmHg, raising suspicion of pseudotumor-cerebri in addition to the expansive process. Taking into consideration the hypothesis of tuberculosis-related corpus-callosum lesion, a biopsy was requested. Histopathological and genetic examinations confirmed the presence of a WHO Grade-II-Astrocytoma (low grade), ruling out the criteria for Glioblastoma or Anaplastic-Astrocytoma. There was no histone mutation. The patient is scheduled for surgical resection of the tumor.





**Conclusions:** This is an unusual manifestation of a low-grade astrocytoma. The Systematic-Review did not identify any reported low-grade gliomas crossing the midline.

## Oncology

ePoster presentation

Study-protocol: Stromal Vascular Fraction application at the surgical site after total-resection in GBM-models: assessing the recurrence rate and overall survival

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**Objectives:** To evaluate the safety and efficacy of autologous SVF in GBM-models after total-resection.

**Background:** Stromal vascular fraction-(SVF)'s effects on Glioblastoma has been studied in pre-clinical investigations, although its mechanism of action and benefits remains unclear.

**Methods:** This study will be an experimental in-vivo-controlled, randomization, and blinded evaluators. We will adhere to the PREPARE and ARRIVE guidelines and the SYRCLÉ's risk of bias checklist. GBM U-87 MG cells will be implanted subcutaneously in the back of 30 adult-male Wistar-rats, and total-resection will be done after 30 days. Rats will be divided into 3 groups (n=10): control(no-intervention), SVF-surgical-site, SVF-intravenously. SVF will be isolated from the unilateral inguinal fat using an enzymatic method with type-I-collagenase. All isolated SVF will be diluted in 1cc of PBS and gently topically applied to the area of the lesion in a standardized manner or injected intravenously intravenously. In the control the fat will be discarded. After surgery and SVF application, the surgical-site will be immediately closed with nylon 4-0, and the rats will be monitored for their Overall Survival rate, recurrence rate, tumor growth, and daily clinical conditions for 40 weeks until euthanasia. Animals that lose 20% of their initial weight will be considered deceased. All animals will undergo a systematic necropsy to evaluate the anatomopathological features of the Glioblastoma-affected area, brain, liver, lungs, and central nervous-system. Descriptive and analytical statistics will be used to compare the findings among the groups and treatments.

**Results:** The study protocol has been established, and the experiments will be conducted.

**Conclusions:** This is the first study that will evaluate the effects of SVF applied into the surgical site after total resection for the treatment of GBM-models. This protocol represents an innovative and disruptive initiative that will contribute to the massive efforts of the medical-scientific community in the pursuit of effective therapies for GBM.

## Skull Base

Oral presentation

### Challenges in management of skull base meningioma in Sub-Saharan Africa - a single centre experience

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**Objectives:** To identify management challenges and outcome of skull base meningioma (SBM) in a resource-limited setting.

**Background:** SBM presents management challenges related to their complex bony anatomic relationship and invasion of adjoining vessels and cranial nerves. A multimodal approach to management is essential, however, limited access to surgical care and the prohibitive cost are challenges in Sub-Saharan Africa.

**Methods:** This was a retrospective analysis of SBM managed between January 2005 to January 2023 in Memfys Hospital, Enugu, Nigeria. Relevant information were extracted, including surgical outcome, histologic diagnoses, and follow-up data. Paediatrics meningioma and other skull base lesions were excluded. Data obtained were used for analysis.

**Results:** Seventy-one SBM were seen, accounting for 29.1% of all meningiomas. Mean age was  $48.7 \pm 8.4$  with female preponderance (2:1). The middle and anterior cranial fossa meningioma were most common (76.5%) with sphenoid wing (38.0%) and olfactory groove (28.2%) commonest. All except one were WHO CNS grade 1 meningioma, with the fibroblastic subtype most predominant (33.8%). Giant meningiomas constitute more than half, with the mean size in the widest dimension  $5.6 \pm 1.9$ cm; two-thirds had Karnofsky Performance score (KPS)  $\leq 60\%$  (mean 64.5%), which were related to late presentation with mean symptom-onset-to-presentation duration of two years. Access to preoperative embolization was not available. Only 63.4% had Simpson 2 excision. Mean follow-up KPS improved to 79.2% ( $p=0.0001$ ). Recurrence rate was 16.9% over a median follow-up of 16.5 months (range 5-96 months) and managed either repeat surgery or radiotherapy. Commonest complications were cranial neuropathy (14%) and hemiparesis (11.7%), which improved in two-thirds on follow-up. The overall mortality rate was 12.9%. Only 3% had complete insurance coverage, and access to post-surgical radiotherapy was limited.

**Conclusions:** We presented the management and outcome of SBM in a resource-low setting. Challenges in management were late presentation, limited insurance and access to radiotherapy services. Government policy targeting these factors may improve outcomes.

## Oncology

ePoster presentation

Stromal Vascular Fraction associated with temozolomide or temozolomide and metformin effects on Glioblastoma-models: overall survival and tumor growth – study protocol

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**Objectives:** To evaluate the safety and efficacy of autologous SVF associated with temozolomide-(TMZ) and/or metformin-(MET) in Glioblastoma-models.

**Background:** Stromal vascular fraction-(SVF) effects on Glioblastoma has been studied in pre-clinical investigations, although its mechanism of action and benefits remains unclear.

**Methods:** This study will be an experimental in-vivo with control, randomization, and blinded evaluators. We will adhere to the PREPARE and ARRIVE guidelines and the SYRCLÉ's checklist. GBM U-87 MG cells will be implanted stereotactically in the brain of 35 adult-male Wistar-rats. Treatment will start 20 days after transplantation, the tumor growth will be confirmed by MRI, and the animals will be randomly assigned to the groups. The animals will be divided into 7 groups (n=5 per group): Control-g (no interventions), SHAM-g, TMZ-g, TMZ+MET-g, SVF-g, SVF+TMZ-g, SVF+TMZ+MET-g. TMZ and MET will be administered orally, while SVF will be given intravenously. SVF will be administered twice, on the 1st and 7th day, and will be isolated from the unilateral inguinal fat of the animal using an enzymatic method with type I collagenase. All isolated SVF will be diluted in PBS and injected intravenously. The animals will be monitored for their overall survival (OS) rate for 25 weeks. Animals that lose 20% of their initial weight will be considered deceased. The OS, tumor-growth, and histopathological characteristics of the lesions and peri-lesions will be evaluated and compared among the groups, as well as with the SVF characteristics within each group and animal.

**Results:** The study protocol has been established, and the experiments will be conducted.

**Conclusions:** This is the first study that will evaluate the effects of intravenously injected SVF for the treatment of Glioblastoma-models. This protocol represents an innovative and disruptive initiative that will contribute to the massive efforts of the medical-scientific community in the pursuit of effective therapies for Glioblastoma.

## Neurovascular Surgery

Oral presentation

Brainstem cavernous malformations: results in 34 patients and validation of Lawton-Garcia grading system as a predictor of surgery outcome

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**Objectives:** The objective of our study was to analyze outcomes of the surgical treatment and to evaluate the correlation between Lawton-Garcia grading system (LG) and Modified Rankin Score (mRS).

**Background:** The brainstem cavernous malformations (BSCM) present a neurosurgical challenge. Several grading systems have been introduced recently with a distinctive emphasis on the need of external validation.

**Methods:** A group of 34 patients (20 male, 14 female) underwent primary surgical BSCM removal. The patients' variables were collected, including the predictor variables used in the LG grading system. The mean age of the group was 40.6 years. The mean diameter of the lesion was 15.1, the location crossing the brainstem midpoint was in 19 patients. An associated DVA was present in six patients. Twenty patients suffered acute hemorrhage (58.8) and 14 patients (41.2 %) revealed chronic hemorrhage. A linear regression analysis was performed to evaluate the correlation between mRS and LG.

**Results:** All patients underwent microsurgical resection with gross-total removal of the lesion. The most common location was pons (50 %), followed by pontomesencephalic junction (29.4 %), mesencephalon (11.8 %), medulla oblongata (5.9 %) and pontomedullar junction (2.9 %). The lesions were exposed using suboccipital midline approach (55.9 %), retrosigmoid approach (14.7%), suboccipital-supracellebelar-infratentorial approach (14.7 %), pterional transsylvian approach (11.8 %) and far lateral approach (2.9 %). Favorable outcomes (mRS 0-2) were observed in 26 patients (76.5 %). Unfavorable outcomes (mRS 3-6) were recorded in 8 patients (23.5 %). This includes two patients (5.9 %) with severe initial neurological deterioration (mRS 4) who died because of postoperative cardiopulmonary decompensation. The statistical analysis showed statistically correlation between the mRS and the LG score.

**Conclusions:** The brainstem cavernous malformations are, with the right indication, surgically treatable with an acceptable postoperative outcome achieved in 76.5 % of our patients. Results of statistical analysis support the significance of Lawton-Garcia grading system.

## Skull Base

ePoster presentation

Acupuncture-Like TENS (AL-TENS) as quantitative-measure for feasibility of intrathecal-sodium-nitroprusside-injection as nitric-oxide-donor in Motor-Neuron-Disease-(MND) for physiological-recovery via 10000-fold-effect pilot study one-case

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**Objectives:** Intrathecal sodium nitroprusside to activate the 10000-fold effect to modulate the retrograde neuroregulation in MND and monitored by ALTENS.

**Background:** Motor Neuron Disease (MND) or Amyotrophic lateral sclerosis (ALS) is a slow fatal neurodegenerative disease characterized by selective and gradual motor neuronal death with unknown aetiology. The insufficient clearance of glutamate through the glutamate transporter, and the specific distribution of Ca<sup>2+</sup>-permeable AMPA receptors in spinal motor neurons, indicates that glutamate-induced neurotoxicity is involved in its pathogenesis. NO is generated by nitric oxide synthase (NOS) which acts via 10000-fold effect to reverse the neuronal death. NO is destructive within 5 to 7 days as noted in earlier study by various authors.

**Methods:** We have used ITSNP in a patient of known case of MND. The time for ITSNP was 2 YEARS post MND diagnosis. ITSNP administered at a dosage of 0.2 mg/kg bo wt at L3/4 LUMBAR PUNCTURE by 20G L P NEEDLE. Pre and post ITSNP was monitored by PRE AND POST IASNP VIDEO RECORDINGS of CLINICAL BENEFITS and ALTENS were performed.

**Results:** PRE-ITSNP clinical video recordings and AL-TENS have been done which showed 3 and 4 CN+ at left lower limbs, 2 hrs POST ITSNP, 24 hrs POST ITSNP, POST ITSNP 7 DAYS, POST ITSNP 14 DAYS. POSTITSNP 24 HRS UPPER LIMBS showed good movements then POSTITSNP 48 HRS LOWER LIMBS MOVEMENTS noted with ALTENS improvements. Video recordings also proved the movements that will be shown in the oral presentations as well.

**Conclusions:** This case was well diagnosed as MND and after giving ITSNP to induce the 10000-fold effect got 75% improvement on 15<sup>th</sup> day of post ITSNP phase.

## Peripheral

Oral presentation

Nerve transfers for axillary nerve repair in brachial plexus injury: results of 206 adult patients

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**Objectives:** The aim of this study is to describe a single-center experience with nerve transfers addressing the axillary nerve on the large cohort of patients and summarize our clinical results.

**Background:** Restoration of axillary nerve function is one of the main priorities of brachial plexus surgery. Neurotization, the transfer of a functional but less important donor nerve to a nonfunctional, more important recipient nerve, has recently become a leading treatment option. A variety of donor nerves have been used to reinnervate the axillary nerve with various degrees of success.

**Methods:** A group of 206 patients with various types of brachial plexus injury was analyzed. All patients underwent axillary nerve reconstruction and had a minimum follow-up period of 24 months. The thoracodorsal nerve was used as a donor in 69 patients, the triceps branch of the radial nerve in 25 patients, lower subscapular nerve in 19 patients, long thoracic nerve in 38 patients, intercostal nerves in 27 patients and fascicle transfer from the ulnar or median nerve in 23 patients. The median age was 31 years, and the median time between trauma and surgery was 6 months.

**Results:** Successful deltoid recovery was defined with muscle strength MRC grade above 3, electromyographic signs of reinnervation and by muscle mass increase. The donor with the highest success rate was triceps branch of the radial nerve (80%), followed by subscapular nerve (78,9%), fascicle transfer from the ulnar or median nerve (73%) and thoracodorsal nerve (71%). Much lower success rate had long thoracic nerve (36%) and intercostal nerves (22%), which were used in complete brachial plexus injury.

**Conclusions:** The overall success rate was 75,5% but varied greatly between different types of brachial plexus injury and corresponded to available donors. Knowledge of effectiveness of even less used donors is utmost importance for nerve surgeon.

## Functional

Oral presentation

### Sacral nerve stimulation in patients with sacral agenesis using 3D printing and intraoperative neuronavigation

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**Objectives:** Caudal Regression Syndrome (CRS) is a rare malformation associated with lumbosacral deformities and gastrointestinal/genitourinary and/or lower limb abnormalities. Sacral neuromodulation (SNM) is one of the therapeutic options with the best outcomes in the presence of refractory gastrointestinal/genitourinary symptoms. Proper lead implantation, typically near the S3 roots, can be challenging in the presence of sacral deformities, due to the absence of bony landmarks typically visualized under fluoroscopy. Our aim is to describe a method for electrode placement based on preoperative planning using 3D replicas of the patient anatomy combined with intraoperative neuronavigation (NN), and report our first two cases.

**Background:** Describe a method for percutaneous lead implantation as an outpatient surgery for patients with sacral deformities.

**Methods:** Two patients with CRS associated with sacral agenesis and refractory neurogenic lower urinary tract dysfunction were selected. Preoperative images were processed, the sacrum was 3D-printed, and the sacral roots were replicated using silicone threads. The bony and neural anatomy could be analyzed, and the target, entry point into the foramen, and introducer angle were defined. This plan was transferred to the navigation system, and the patients underwent awake surgery under neurophysiological control.

**Results:** Intraoperatively, NN allowed real-time visualization of the introducer's position and placement of the electrode at the desired location and depth. Correct positioning was confirmed by stimulation with a typical S3 response (flexion of the hallux and bellows reflex) and fluoroscopy. In both patients, the electrical generator was implanted, resulting in a good clinical response.

**Conclusions:** The presence of a 3D replica improves the spatial understanding of sacral anatomy. Together with NN, it can be used to overcome the technical challenge of placing SNM electrodes in patients with bony deformities.



## Spine

ePoster presentation

Anterior interbody fusion at 3 levels with no plate for cervical degenerative multilevel disc disease. An alternative treatment

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**Objectives:** Compare the results obtained with different cervical fusion techniques at three levels.

**Background:** Anterior cervical instrumentation that supports segmental stability immediately along the spine, thus anterior cervical fusion systems have become an integral part of the surgical armamentarium to achieve interbody fusion in the subaxial cervical spine (C2- C7). Non fusion is a mean issue when 2 and mainly 3 levels need to be fused.

**Methods:** A series of 10cases operated between the years 2016 and 2022 with degenerative multisegmental disc pathology that underwent cervical arthrodesis surgery for anterior interbody fusion of 3 segments with a cages with screws is presented.

**Results:** Acces to the spine through an anterior approach can be challenging due to anatomical variations, previous surgeries, or the inherent pathologic process, requiring additional dissection with wider exposures or greater retraction, which is associated with complications. Common as soft tissue injuries and edema, as well as adjacent vascular and nerve injuries. Internal fixation with a screw-retained cage system provides direct immobilization and rigid fixation that improves fusion rates, replacing the need for plate application. The fusion rate is 96%which is comparable with the plate series that have published recently.

**Conclusions:** In recent years there has been an intense evolution in this area of instrumentation, in search of the clinical ideal of product versatility, improved fusion rates and ease of application. There are multiple techniques to stabilize and rebuild a structurally compromised spine. There are few studies comparing fusion techniques with plate versus without plate at more than 2 levels. From a socioeconomic point of view, patients who receive these implants may require shorter hospital stays, have less or no need for an external cervical orthosis, and return to work earlier than those who undergo cervical fusion procedures without plates. More comparative studies and research should be carried out in this regard.

## Global Neurosurgery

Oral presentation

When surgery is unaffordable: health economics of cranial reconstruction following decompressive craniectomy for TBI - findings from an international survey

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### Objectives:

This study, based on data provided by an international group of healthcare providers, evaluates the health economics of cranioplasty for TBI, focussing on understanding affordability and barriers that preclude patients from accessing cranial reconstruction.

**Background:** Cranioplasty facilitates rehabilitation and aids reintegration into society following decompressive craniectomy for TBI. Globally, patients accessing cranioplasty face challenges including costs and lack of resources, with LMICs disproportionately affected. Out-of-pocket payments for surgery are a major barrier to accessing care, but the financial burden associated with cranial reconstruction is unclear.

**Methods:** A provider-focussed online international survey was disseminated to centres performing cranioplasty following TBI to understand global cranioplasty practice. Data was examined in relation to cost/expenditure relating to cranioplasty. Reference data on financial metrics for individual countries was obtained from the World Bank, and the 6th Lancet core surgical indicator (protection against catastrophic cost) was calculated. Results were summarised using descriptive statistics.

**Results:** Responses were received from 88 individual institutions across 40 countries (37 in high-income, 14 in upper middle-income, 23 in lower middle-income, 14 in low-income countries). Sixty-nine centres provided estimated cranioplasty operation costs. Eight centres across 7 LMICs reported the procedure costs to be greater than the country's gross national income (GNI) per capita. Patients or relatives were responsible for at least part of healthcare costs (out-of-pocket expenditure) in only 25% of high-, 29% of upper-middle-, 70% lower-middle-, and 71% of low-income countries. Catastrophic costs related to cranioplasty (6th Lancet core surgical indicator, defined as an expenditure greater than 10% of the average household income) were identified across 25 centres (83%) in LMICs where patients pay at least partially out-of-pocket.

**Conclusions:** Results show that cranioplasty following decompressive craniectomy is associated with high, often catastrophic, costs for patients and families. Unaffordability of surgery is a key barrier to accessing care, which requires ongoing advocacy and policy efforts.

## Paediatric

Oral presentation

10,000-fold effect by a nitric-oxide-donor (Sodium Nitroprusside) in Duchenne muscular dystrophy via intrathecal superfusion of sodium nitroprusside and oral tadalafil

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**Objectives:** ITSNP and TADALAFIL to activate the 10000-fold effect to modulate the retrograde neuroregulation in DMD.

**Background:** Duchenne muscular dystrophy (DMD) is a slow fatal disease of specifically neuromuscular junction (NMJ) due to POST NMJ sarcolemmal dynorphin deficit, which attaches the NMJ to the contractile muscle mechanism. This causes influx of excessive amount of calcium in muscle, then muscle is fibrosed and damaged.

There happens to be abundance of nNOS enzyme at the POST NMJ which responds to the electrical impulse from PRE NMJ neurons and releases nitric oxide (NO) in the synaptic cleft of NMJ. Thus via 10000-fold effect the cGMP is activated causing muscle contraction. With the deficit/defective dynorphin this impulse doesn't propagate to muscle's contractile mechanism. Via 10000-fold effect the nNOS can be activated via INTRATHECAL SODIUM NITROPRUSSIDE SUPERFUSION (ITSNP) and oral TADALAFIL which can be monitored by ACUPUNCTURE LIKE TRANS EPIDERMAL STIMULATION (AL-TENS) accurately.

**Methods:** A 12-year-old male on wheel chair with chief complaints of weakness lower limbs on both side. On examination he has full GCS E5V5M6 (GLASGOW COMA SCALE), cranial nerves examination revealed normal. Motor examination showed weak upper and lower limbs. ASIA grading done in motor, sensory and bladder bowel involvement. Motor, normal nutrition of upper limbs and lower limbs both sides, tone increases on both sides, power 5/5 bilateral upper limbs and 1/5 bilateral at hip joints. Sensory examination is showing 224/224 (all over body normal) without bladder bowel involvement. MRI of brain normal. Muscle biopsy showed no dynorphins.

**Results:** After giving ITSNP to induce the 10000-fold effect got 75% improvement as seen by video recordings and ALTENS on 15<sup>th</sup> day of post ITSNP phase.

**Conclusions:** This case was well diagnosed as MND and after giving ITSNP to induce the 10000-fold effect got 75% improvement on 15<sup>th</sup> day of post ITSNP phase.

## Peripheral

Oral presentation

Risk factors for obstetrical brachial plexus palsy: can we predict the failure of spontaneous reinnervation

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**Objectives:** The aim of study was to determine the occurrence of risk factors for birth injury and define such factors that could predict failure of spontaneous reinnervation and the necessity of surgery.

**Background:** Obstetrical brachial plexus palsy represents one of the most serious complications during delivery. Most children show good spontaneous recovery, but in 20% to 30% an important residual motor impairment remains. To determine if early surgical reconstruction is indicated, predicting recovery is necessary but difficult.

**Methods:** This retrospective study was formed by a group of 227 patients with OBPP. Gender, weight, length, possible instrumental delivery, clavicle and humerus fracture, gestational diabetes, Horner's syndrome and Apgar score were observed for each patient. Another observed parameter was the initial state of movement of the upper limb.

**Results:** In 175 patients (77.1%) good spontaneous recovery was observed, but a severe motor deficit remained in 52 patients (22.9%) and underwent reconstructive surgery. The median weight was 3970g, length 52cm. Of the 227 patients, 14.9% had clavicle fracture, gestational diabetes was present in 11.8%, Horner's syndrome in 4.8% and instrumental delivery in 14.5. Statistical analysis, univariate and multivariate linear regression, shows the initial state of movement as the main factor predicting the failure of spontaneous regeneration, AMS (cont.var.) adj. OR 0.94,  $p < 0.001$ . After exclusion of this dominant parameter from analysis, the significant association of Horner's syndrome, macrosomia and humeral fracture with insufficient spontaneous reinnervation was found.

**Conclusions:** The study confirmed the increased occurrence of risk factors in the group of insufficient spontaneous reinnervation. Despite of this findings no such risk factor was found that would clearly predict the failure of regeneration. The most statistically significant parameter predicting the failure of spontaneous regeneration was the movement of the upper limb at 6 weeks. Horner's syndrome, macrosomia and humeral fracture were associated with insufficient spontaneous reinnervation.

## Trauma

Oral presentation

### MAST Trials – strengthening the evidence behind the use of antiepileptic drugs in TBI patients

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**Objectives:** This NIHR HTA funded project aims to define best practice in the use of AEDs for TBI patients by conducting two studies run in parallel but independent of each other.

**Background:** Post-traumatic seizures (PTS) are classified as early (within 7 days post-TBI) or late (after 7 days). The incidence of early PTS following severe TBI is as high as 14% and their prevention can limit impairments in brain autoregulation, and may prevent development of late PTS. There is no high quality evidence regarding the optimal duration of treatment for patients started on an AED for acute PTS or regarding their prevention.

**Methods: MAST Duration:** A multi-centre, pragmatic, randomised trial (428 patients) to compare the clinical effectiveness (absolute difference in rate of late PTS 24 months post-TBI) of a longer course of AED (>6 months) versus a shorter course (up to 3 months) for TBI patients with early PTS.

**MAST Prophylaxis:** A multi-centre, pragmatic, three arm, randomised trial (1221 patients) to compare the clinical effectiveness (absolute difference in the rate of PTS within the first 2 weeks post-TBI) of a 7-day course of prophylactic phenytoin or levetiracetam versus no AED.

**Results:** Both studies are now in their third year of recruitment. 465 patients have been enrolled in MAST Prophylaxis, while 115 patients were recruited in MAST Duration.

**Conclusions:** Our trials are still open to recruitment and we are planning to open new Sites abroad. Please contact us for further information at ev349@cam.ac.uk.

## Global Neurosurgery

ePoster presentation

Analysis of the resources available for the development of neurosurgery services in low-income and medium-income countries

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**Objectives:** Highlight the need to create a mechanism for analyzing the resources available in low- and middle-income countries for the development of neurosurgery.

**Background:** There has been spectacular progress in neurosurgery in the world in the last four to five decades. Yet, in spite of the great advances in the field of neurosurgery there are major problems in variability of the quality of care across institutions, no defined minimum standard of care, long distance patient has to travel for treatment, inadequate follow-up and inadequate neuro-rehabilitation facility.

**Methods:** A narrative review of the literature regarding research methodology, education, economics, health policy, health advocacy, relevant to global neurosurgery was conducted. We focused around neurosurgery services in LMICs countries and the resources they have to deal with neurosurgical pathology was carried out. The World Bank classification was considered to classify the economy of the countries.

**Results:** The Lancet Commission on Global Surgery has focused its attention on the lack of surgical care worldwide; neurosurgical care needs to be better distributed around the world, with a major focus on LMICs countries. Neurosurgical diseases have a high impact on families, individual quality of life, and cost for the society. Implementation of neurosurgical care in poor settings is not easy.

**Conclusions:** The increasing cost of neurosurgical care as well as the infrastructure cost has become a problem in resource limited countries. One of the methods to ease some of the problems is optimal use of resources. The design of a system fed by a joint database that allows medical centers to identify the available resources and receive support to optimize them would allow these countries and the professionals who practice neurosurgery there to provide patients with a better quality of care. It is responsibility of the neurosurgical community to identify major areas of current gaps and outline strategies for intervention.

## Functional

ePoster presentation

10,000-fold effect by a nitric oxide donor (Sodium Nitroprusside) in essential tremor via intrathecal superfusion

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**Objectives:** Intrathecal-sodium-nitroprusside-superfusion (ITSNP) to induce 10000-fold-effect to decrease the essential tremors.

**Background:** Essential tremor (ET) is involuntary tremors at upper part of body specially. The pathological neural circuits of GABAergic neuron of cerebellar dentate nucleus, brain stem (locus ceruleans and inferior olives) and thalamus is involved causes tremulous activity within the cerebellothalamocortical circuits. Nitric oxide donors, like Sodium nitroprusside, modulates the antegrade neurotransmission via retrograde neuroregulation by 10000-fold effect. The GABAergic neurons are in turn controlled by the very sensitive 10,000-fold effect circuits via Nitric Oxide. We have utilised after 2 years of failed routine conservative treatment by oral drugs like gabapentin, topiramate, trihexiphenedyl, or other drugs recommended in one ET cases.

**Methods:** A 42-year-old male with bilateral upper-limbs symmetrical, involuntary-rhythmic-oscillatory-movement, with movements of central body and no movements of head, larynx, tongue and chin. These tremors are relieved by the alcoholic ingestion to a small extent. Full GCS E5V5M6, normal cranial nerves. Motor-examination showed bilateral upper limbs, head, central axis body tremor in rest and followed by a kinetic and resting component. Muscles have normal nutrition, power and reflexes of upper limbs and lower limbs on both sides without bladder bowel involvement. ET examination done such as drinking water from a glass, holding arms outstretched, writing and drawing a spiral (T-CALM-Essential-tremor-tests). Archimedean-spiral-drawings done in pre and post-ITSNP phase. MRI of brain stem showed normal study in T1/T2/flair images. MRA was normal.

**Results:** Post ITSNP T-CALM ET test done again after 2 hours, 24 hours, 7<sup>th</sup> day and 9<sup>th</sup> day with video recordings 95% absence of tremors as told by patient himself.

**Conclusions:** In chronic nondrug responding Essential-tremor after giving ITSNP to induce the 10000-fold effect got 95% improvement on 9<sup>th</sup> day of post ITSNP phase achieved and in T-CALM test (Archimedean spiral drawings and handwriting) and video recordings.

## Spine

ePoster presentation

Adaptation of the management guidelines for spinal neurotrauma to LMICs, more than a necessity an obligation

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**Objectives:** Know management strategies for spinal cord trauma in low-resource countries.

**Background:** While the development of neurosurgery and its availability to its citizens is more or less uniform in the high-income group (HIG) countries the major problem in middle and low-income group (LMICs) countries is the lopsided distribution of the trained neurosurgeons and neurosurgical facilities. Yet, in spite of the great advances in the field of neurosurgery there are major problems in variability of the quality of care across institutions, no defined minimum standard of care, long distance patient has to travel for treatment, available resources.

**Methods:** A narrative review of the literature relevant to spinal cord trauma management strategies in low- and medium-income countries (LMICs), was conducted. The World Bank classification was considered to classify the economy of the countries.

**Results:** Neurosurgical care needs to be better distributed around the world, with a primary focus on low- to middle-income countries. Neurosurgical diseases have a high impact on families, individual quality of life, and cost to society. The current management guidelines for spinal cord trauma are designed by experts from countries with high resources and are not adapted to the reality of countries with low and medium resources. It is true that neurosurgeons must fight to improve health policies in these countries, but we need to adapt management guidelines to the reality of these countries to provide treatment alternatives to patients who require it.

**Conclusions:** The increasing cost of neurosurgical care as well as the infrastructure cost has become a problem in resource limited countries. Poverty is still widespread and insurance coverage is very dismal, so affordability becomes an issue. It is responsibility of the neurosurgical community to identify major areas of current gaps and outline strategies for intervention adapted to the reality of these countries and the resources available in them.



## Skull Base

Oral presentation

Idiopathic trigeminal neuralgia: various modalities of treatment and its long term outcomes

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**Objectives:** This study is to compare long term pain relief in trigeminal neuralgia after Microvascular decompression, Radiofrequency ablation and Gamma knife radiosurgery.

**Background:** Common surgical treatments for trigeminal neuralgia (TN) include microvascular decompression (MVD), stereotactic radiosurgery (SRS), and radiofrequency ablation (RFA). Although the efficacy of each procedure has been described, few studies have directly compared these treatment modalities on pain control for TN. Study is to compare long term effects of these modalities in terms of pain free period and recurrences of pain.

**Methods:** Retrospective analysis of all cases undergoing MVD, GKRS, and RFD between 2007 to 2017. Patients who have five years follow up alone included in study. All demographics details and pain relief after procedure is taken to account.

**Results:** Microvascular decompression performed in 66 patients, pain free period of 69 months achieved . 12% had recurrence of pain.90% had relief of pain. In RFA group 184 patients Pain free period of 48 months achieved in 60% of patients. Recurrence or no pain relief in 72 patients. Neurovascular conflict was present in 25% of patients. In GKRS group 61 patients was followed. 55% had good pain relief and pain free period was 30 months. Recurrence or no pain relief present on 45% of patients.

**Conclusions:** In this study, patients who received MVD had longer pain-free intervals compared with those who underwent GKRS or RFA. Surgical decision making depends upon many factors. This information can help surgeons counsel patients with idiopathic TN on treatment selection.

## Skull Base

Oral presentation

Endoscope-assisted surgical approach to posterolateral foramen magnum, cadaveric study

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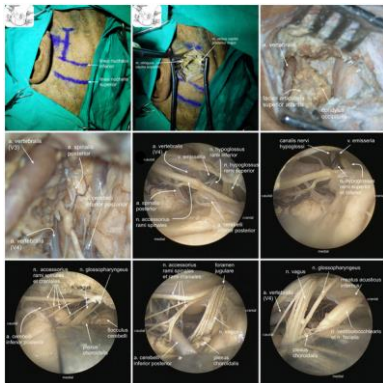
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**Objectives:** The aim of this study is to determine the feasibility of a minimally invasive approach with aid of endoscope compared to the standard surgical approaches to posterolateral foramen magnum, to describe the required steps and to study the surgical microanatomy of the region.

**Background:** The standard approaches require extensive soft tissue dissection and long durations of surgical time. With an aim of a possibly minimally invasive approach to the region, the main targets of the approach are the intradural or extradural pathologies located at the posterolateral portion of foramen magnum.

**Methods:** Anatomical dissections were performed on seven formaldehyde-fixed human cadavers, a total of 14 sides. The cadavers were positioned accordingly for each side. 5-6 cm long skin incision located 2 cm posterior to mastoid process, stretching from just above the inferior nuchal line to the level of transverse process of atlas was made. Suboccipital muscles were dissected with respect to muscular planes. One-sided suboccipital craniectomy and partial condylectomy were performed for each side under the microscope. From that point, the surgical simulation was conducted with microscopic and mostly endoscopic assistance.

**Results:** Intradural structures were visualized with microscope and endoscope after dural opening performed. Lower cranial nerves, vertebral artery V3 and V4 segments, posterior inferior cerebellar artery were identified at each dissection.



**Conclusions:** Our study showed that an endoscope-assisted minimally invasive approach to posterolateral foramen magnum is applicable. The exact advantages and disadvantages of this approach will be shown with the future use on patients.

## Trauma

Oral presentation

Prevalence, risk factors and prognosis of ultra-early, early and late seizures after traumatic brain injury: a CENTER-TBI study

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**Objectives:** To determine the prevalence and risk factors of ultra-early, early and late PTS and its association with outcome in patients with TBI.

**Background:** Posttraumatic seizures (PTS) is a clinically relevant complication of traumatic brain injury (TBI) with uncertain incidence and risk factors.

**Methods:** CENTER-TBI study, that was conducted in 65 European trauma Centres from 2014–2017. We identified patients with PTS after TBI. Prevalence was of PTS stratified into ultra-early (prehospital and ED), early (in-hospital) and late (post-discharge: 2 weeks, 3 months, 6 months and 12 months). The association of baseline variables with early and late PTS were modelled in multivariable logistic regression to determine risk factors for PTS. The association of ultra-early and early PTS with in-hospital endpoints (length-of stay [days], complications [neurological and systemic], and time to obey commands [days]), late PTS, functional outcome (Glasgow Outcome Scale Extended [GOSE]) and quality of life (Quality of Life After Brain Injury [QOLIBRI]) were modelled in appropriate multivariable regression respectively.

**Results:** 456 of 4509 patients (10.1%) developed at least one seizure one year post-TBI. Ultra-early PTS occurred in 4.3% (197/4509), early PTS in 4.5% (204/4509) and late PTS in 3.5% (160/4509). When restricting to admitted patients (ward or ICU), the prevalence of early PTS was 5.5% (204/3679). Risk factors for early PTS were pre-existing severe systemic disease on the American Society of Anesthesiologists classification (OR 3.9, 95% CI 1.6–9.6); pre-hospital insults (OR 9.1, 95% CI 4.5 – 18.3); cortical and basal subarachnoid haemorrhage (OR 4.1, 95% CI 1.6–10.1). PTS was independently with a lower GOSE after case-mix adjustment (proportional odds common OR, 95% CI) but showed no association with QOLIBRI. Also, PTS was associated with a more complicated clinical course.

**Conclusions:** To date, this is the first international cohort studying PTS. They seems associated to pre-existing systematic disease, pre-hospital insults and cortical and basal subarachnoid haemorrhage.

## Paediatric

Oral presentation

### Efficacy of Endoscopic Third Ventriculostomy (ETV) in the management of shunt failure and its predictive factors

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**Objectives:** Aim of the study is to evaluate ETV efficacy in terms of ventriculoperitoneal (VP) shunt removal in pediatric patients with shunt failure.

**Background:** Endoscopic third ventriculostomy (ETV) is known as a safe procedure for obstructive hydrocephalus and it is gaining popularity as an alternative to shunt revision in the management of shunt malfunction.

**Methods:** We retrospectively reviewed the medical records of 76 patients undergoing secondary ETV at Meyer Children's Hospital between 1998 and 2022.

To assess the risk of failure of secondary ETV, the Hazard Ratio (HR) and corresponding 95% confidence intervals were calculated. Kaplan-Meier survival curves were constructed and stratified for all variables whose HRs were significant.

**Results:** In a total of 76 patients, the mean age for secondary ETV was 10 years ( $10 \pm 9.6$ ).

The cause of hydrocephalus was post-hemorrhagic in 30% of patients, followed by congenital in 17%, neural tube defects in 13%, aqueductal stenosis in 11%, post-infectious in 11%, tumor in 5%, cyst in 5%, associated with Chiari I in 3% and trauma in 1%.

The overall success rate for secondary VCS was 59% with 45 patients without shunt at last follow-up. The median time between secondary ETV surgery and reintervention was 14.5 days (interquartile range, IQR, 3-100) for patients with secondary ETV failure. The mean follow-up time for patients with successful Secondary ETV was 1698 days (266-3729). We observed a significant increased risk of ETV failure among patients undergoing external ventricular drain EVD (HR = 5.09; 95% CI). The risk remained significant after adjustment for sex and age at secondary ETV surgery.

**Conclusions:** EVD was the only significant factor ( $P < 0.01$ ) with negative influence on the success of secondary ETV. Increased age at first procedure and increased years between first procedure and secondary ETV appeared to be directly associated with favorable outcome, however, they were not statistically significant.

## Functional

ePoster presentation

10,000-fold effect by a Nitric Oxide donor (Sodium Nitroprusside) in Parkinsonism via intrathecal superfusion

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**Objectives:** Intracarotid and intrathecal sodium nitroprusside to activate the 10000-fold effect to modulate the retrograde neuroregulation in Parkinsonism as a pilot study

**Background:** Parkinsonism is a slow but nonfatal neurodegenerative disease characterized by hypokinesia, rigidity, postural instability and tremors, due to low quantity or deficient in dopamine neurotransmitter at Substantia Nigra, parkinsonism develops in, may be because of toxins, head injury or infections or drugs. Dopamine release is also regulated by NO (Nitric Oxide) which is generated by nitric oxide synthase (NOS) and NO acts via 10000-fold effect to reverse the neuronal parkinsonism clinical features.

**Methods:** 52-year-old on wheel chair with complaints of hypokinesia, rigidity, postural instability and tremors. He has been treated with nearly all anti parkinsonism drugs of nearly each group. Then he was planned for DBS (deep brain stimulation). GCS E5V5M6, cranial nerves normal. Sensory and autonomic examination normal. Clinical features showed hypokinesia (especially fascial region), rigidity (clasp knife rigidity), postural instability (can't walk fast) and tremors (around 6 hertz per seconds) of whole body. Motor examination showed normal nutrition of upper limbs and lower limbs both sides, tone increases on both sides, power 5/5 bilateral all myotomes, grip 100% on both sides. All Deep Tendon Reflexes and Superficial reflexes were normal. MRI of brain stem done which showed normal features in T1 and T2 and flair images.

**Results:** The postural instability vanishes completely in 24 hours, loss of tremors was in just 48 hours, loss of rigidity around 5 days and hypokinesia improvement (to 75%) more than 30 days.

**Conclusions:** This case was well diagnosed as Parkinsonism clinically and after giving ITSNP and IASNP to induce the 10000-fold effect got 85% (as per patient's clinical response and in his own words) improvement on 38<sup>th</sup> day of post ITSNP and IASNP phase.

## Endovascular Neurosurgery

ePoster presentation

Microvascular decompression for trigeminal neuralgia – experience from a low-middle-income country

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**Objectives:** To evaluate the efficacy of microvascular decompression (MVD) in the management of classic cases of Trigeminal Neuralgia (TGN).

**Background:** TGN is a unilateral, ipsilateral, paroxysmal disorder of excruciating facial pain in the distribution of trigeminal nerve. Multiple techniques have been used to treat TGN, including pharmacotherapy, radiosurgery, rhizotomy and microvascular decompression. However, the efficacy and outcomes of microvascular decompression are not well-understood in Pakistan.

**Methods:** This retrospective, cross-sectional study assessed the data of 30 patients, who underwent MVD at the Department of Neurosurgery, Unit – III, Punjab Institute of Neurosciences, Lahore, Pakistan, from May 2022 to May 2023. Information regarding patient demographics, clinical presentation, Barrow Neurological Institute Facial pain Score (BNI–FPS), intra-operative findings, and postoperative complications were analyzed.

**Results:** Out of the 30 patients, 63.33% were males and 36.67% were females, with a mean age of  $41.58 \pm 4.23$  years. Unilateral facial pain was the consistent clinical presentation among all patients, with right-sided involvement in 76.67% patients. All patients had involvement of at least two divisions of trigeminal nerve; maxillary nerve in 76.67% cases being the most frequently affected division. BNI–FPS Grade IVb was found among 33.33% patients on presentation. Arachnoid adhesions, impinging superior cerebellar artery and superior petrosal vein were the most common causes of compression in 76.67%, 43.33% and 43.33% cases respectively. All patient were discharged home on first post-operative day without complications and with BNI–FPS Grade I.

**Conclusions:** Microvascular decompression is highly advocated in classic cases of TGN. Precise placement of synthetic polymers between the offending vessel and TGN and aseptic technique produce remarkable clinical outcomes, as in our study. Arachnoid adhesions were the most common cause of TGN compression at our center, with maxillary involvement in majority cases. We advocate the utilization of BNI–FPS as a marker of preoperative and postoperative severity assessment.

## Global Neurosurgery

ePoster presentation

### Elsberg syndrome – a systematic review of case reports of two decades

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**Objectives:** This article aims to explore the epidemiology, most common causative agents, and diagnostic methods and possible treatment modalities of Elsberg syndrome.

**Background:** Elsberg syndrome is an acute bilateral lumbosacral myeloradiculitis associated with acute urinary retention and constipation. It is a rare complication reported due to an active infection or reinfection with the Herpes virus family. It must be considered as the differential in patients presenting with the signs and symptoms of lumbosacral myeloradiculitis, as missed diagnosis or delay in commencing the treatment can have devastating neurological consequences. To our best knowledge, this is the first systematic review exploring the potential causes and treatment modalities for Elsberg syndrome.

**Methods:** A thorough literature search was conducted using PubMed, Google Scholar, and SCOPUS articles published from 2000-2023. The Boolean scheme was applied to the appropriate keywords using the MESH strategy and the findings were reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Nineteen case reports were included in the final analysis based on predefined inclusion and exclusion criteria.

**Results:** Herpes zoster virus and herpes simplex virus type II were found to be the most common causative agents (36.84% of the cases), followed by the parasite *Angiostrongylus cantonensis* (10.52%). The most common presenting symptoms reported included lower limb sensory deficit and urinary retention. MRI findings were non-significant in most cases (42.01%). Definitive treatment, which included the antiviral or antiparasitic drugs given in 73.68% of the cases.

**Conclusions:** Elsberg syndrome is considered a differential in patients with a prior or recent history of HSV or VZV infection presenting with signs and symptoms of acute lumbosacral myeloradiculopathy. Treatment options include antivirals or antiparasitics depending on the causative agents and are effective in patients suffering from Elsberg syndrome. The addition of corticosteroids can counteract the inflammation caused by this syndrome and has shown promising results.

## Paediatric

ePoster presentation

### Efficacy and inefficacy of filum terminale sectioning: a literature review

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**Objectives:** Aim of the study is to conduct a comprehensive literature review on the efficacy and inefficacy of filum terminale sectioning. We aim to discriminate between the surgical indications for FTI / FTE transection and whether the sectioning of FTE only, could have the same effects as the intradural counterpart.

**Background:** Filum terminale (FT) is the continuation of the pia mater at the end of the spinal canal. It is classically divided into filum terminale internum (FTI), which travels from the conus medullaris within the dura mater, and into filum terminale externum (FTE), the prosecution of FTI after the merging with the end of the thecal sac. The FTE moves downwards through the sacral hiatus and terminates on the back of the coccyx.

Surgical sectioning of FTI is accepted worldwide in the context of tethered cord syndrome while section of FTE lacks a thorough scientific debate.

**Methods:** Using the PRISMA guidelines for systematic reviews, forty-three papers met our inclusion criteria and were included in the study.

**Results:** Even with a rather poor level of evidence and the lack of reliable data, a consensus seems to be reached regarding the inefficacy of FTI sectioning for Chiari malformation and occult tethered cord syndrome.

Only few articles support the sectioning of FTE alone, and no scientific evidence has been provided so far.

**Conclusions:** At the present moment, there is a lack of scientific support for the sectioning of FTI without evidence of tethered cord, as for the FTE alone. Standardized protocols and further studies would be needed to prove otherwise.



## Epilepsy

Oral presentation

### Long term incidence of seizures post craniotomy and tumour resection with prophylactic antiepileptic drugs

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**Objectives:** We aimed to evaluate incidence and timing of seizures post craniotomy with prophylactic AEDs and the long-term seizure management and driving status of patients.

**Background:** The incidence of seizures post craniotomy is reported to be 15-20%. Prophylactic use of antiepileptic drug use for craniotomy surgery is not supported in the literature. Nevertheless, 36% of Australian neurosurgeons routinely use prophylactic AED, with the duration being most commonly 7 days (77%). Our institution routinely uses prophylactic AEDs, with 3 monthly radiological surveillance and clinical review post craniotomy and tumour resection. Driving restrictions vary but are usually 6 months post craniotomy or 12 months of seizure freedom on AEDs.

**Methods:** We conducted a retrospective chart review of patients in the PAH Brain Tumour Clinic from 1/1/2021-8/5/2023 who had previous underwent brain tumour resection. All patients received AED prophylaxis for at least 7 days post craniotomy.

**Results:** 380 patients were included: GBM (34.4%), astrocytoma (18.8%) and oligodendroglioma (17.3%). Average follow up post-surgery was 5.7 years (median 3.2 years). 50.8% never had a seizure, 16% had only preoperative seizures, 11.4% had both pre and post operative seizures and 21.2% developed new seizures post operatively. 14% of seizures occurred within 7 days, 35.5% within 3 months and 56.2% within 6 months. Median time of onset was 5.25 months post surgery. 67% of seizure patients had further seizures with a median duration of 10.5 months until adequate seizure control. Long term AED use comprised of 60% Levetiracetam monotherapy and 30% on multiple agents. 53% of patients returned to driving during their outpatient follow-up.

**Conclusions:** Post craniotomy seizures are common and have delayed onset, late identification, and often inadequate titration of AEDs. Closer follow up and greater involvement of an Epilepsy specialist may result in improved seizure management, a shorter time to achieve seizure freedom and a faster return to driving.

## Endovascular Neurosurgery

ePoster presentation

Fatal outcome due to iatrogenic iliac artery perforation during large-bore femoral sheath insertion for neurointervention/two cases and literature review

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**Objectives:** Femoral artery access is a basic procedure in neurointervention. However, most neurosurgeons do not pay attention to performing the procedure.

**Background:** Fatal outcome during large-bore femoral sheath insertion in a neurosurgery residency training program. Causes and reasons are explained in detail.

**Methods:** Two patients visited the outpatient department with unruptured cerebral aneurysms. One is a 79-year-old male and the other a 70-year-old female. An iatrogenic artery perforation occurred during insertion of a large-bore femoral sheath. The ipsilateral external iliac artery was ruptured with a sheath without dilator and a short guide wire, and the contralateral common iliac artery was dissected with a short guide wire and dilator. Two patients died due to recurrent bleeding despite interventional treatment.

**Results:** There should be no space between the femoral sheath and dilator during assembly and they should be locked together. Otherwise, the vessel wall may be damaged during indwelling. Skin incision is the first step in the femoral artery puncture procedure after local anesthesia. Therefore, there must be sufficient space for the diameter of the femoral sheath to be located. The small skin incision causes the skin to reflect inward, confusing resistance when inserting the sheath. Advance the sheath with the dilator assembly with the one hand and secure the short guide wire with other hand. This is because the resistance of navigation could be felt through the guide wire. Continuous fluoroscopy is the best way to confirm the safety of sheath insertion, and fingertip feel is paramount throughout the entire step.

**Conclusions:** Femoral sheath insertion is the most important procedure and the first step. The neurointerventionist must not overlook essential procedures and must learn to feel the hand and see each step with fluoroscopy.

## Paediatric

Oral presentation

### Evolution of syringomyelia after spinal cord detethering in pediatric patients with spinal cord lipomas

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**Objectives:** Aims of this study were to characterize syringomyelia in pediatric patients with lipomas and to record the evolution of syringomyelia following surgical detethering of the spinal cord. Patients were also assessed for the presence of Chiari malformation and hydrocephalus.

**Background:** Syringomyelia and lipomas are two distinct pathological entities that can occur in the spinal cord. While syringomyelia is characterized by the presence of a fluid-filled cavity within the spinal cord, lipomas are benign fatty tumors originating from the subcutaneous tissue. Both conditions have been extensively studied individually, but their relationship and potential interplay may require further investigation.

**Methods:** Pediatric patients with lipoma and syringomyelia undergoing surgical detethering at Meyer Children's Hospital between 2007 and 2020 were included in the study. The diagnosis of spinal dysraphism and the characterization of syringomyelia were based on magnetic resonance imaging (MRI).

**Results:** Among a total of 49 patients, the median age was 7,08 years old and male to female ratio was 29/20. Diagnosis was lipoma in 39 (80%) cases, lipomyelomeningocele in 5 (10%) and lipomyelocele in 4 (8%). Six patients (12,2%) presented Chiari Malformation type I and three patients (6,1%) were affected by hydrocephalus. Median follow up was 67,6 months. The outcomes of syringomyelia were classified into stable for 31 (63,3%) patients, improved in 12 (24,5%), progressed in 1 (2%) and complete resolution in 5 (10,2%).

**Conclusions:** Surgical detethering of spinal cord in the context of spinal lipomas appears to be beneficial also regarding the evolution of syringomyelia, when associated. The syringomyelia didn't progress in 63,3% of patients after detethering surgery, and it improved in other 24,5% of them. For the majority of the patients included in this study, further surgeries for syringomyelia were not required after the correct management of spinal lipomas.

## Spine

Oral presentation

### Assessment of factors affecting pain outcome following non-instrumented lumbar decompressive surgery for degenerative spine disease

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**Objectives:** This study assessed the impact of age, gender, body mass index, and duration of symptoms on the degree of pain outcome after lumbar decompressive surgery for DLSD.

**Background:** Selected patients with degenerative lumbar spine disease (DLSD) with foramina stenosis have shown that surgical decompression is effective in managing their pain complaints. However, the degree of pain outcome are affected by several factors.

**Methods:** This research is prospective and longitudinal. The metric visual analogue score (mVAS) and the Oswestry disability index (ODI) were used to evaluate radicular and low back pain (LBP) in patients who underwent non-instrumented lumbar decompressive surgery for symptomatic DLSD. This assessment was carried out in the preoperative period and six months following surgery. The collected data were analyzed.

**Results:** 67 patients in total completed the study; 36 (54%) were male and 31 (46%) were female. The average age and mean BMI were 55.28 years and 29.6 kg/m<sup>2</sup>, respectively. At six months following surgery, there was overall significant pain reduction from preoperative baseline mVAS for low back pain (67.12 to 32.74), mVAS for radicular pain (75.39 to 32.75), and ODI (65.30 to 27.66) with  $p < 0.05$ . A long duration of symptoms (lasting more than 12 months) was a predictor of poor outcome ( $p < 0.05$ ). Additionally, ODI revealed a greater improvement in females compared to males ( $p < 0.05$ ). Age and BMI of the patients had no discernible effects on any of the pain outcome variables ( $p > 0.05$ ).

**Conclusions:** In lumbar decompressive surgery for DLSD, a long duration of pain symptoms (pain lasting more than 12 months) is a predictor of a poor pain outcome. Additionally, compared to female patients, male patients had less postoperative pain relief. Age and BMI of the patients did not, however, affect pain outcome.

## Functional

ePoster presentation

Role of 10000-fold effect in improving leg cramps in myelopathic spinal cord changes – a case study

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**Objectives:** Intrathecal sodium nitroprusside to activate the 10000-fold effect to modulate the retrograde neuroregulation in muscle cramps in cervical myelopathy in a case.

**Background:** Leg muscle cramps in cervical myelopathic changes is inconsistent symptom and later on very disturbing to the patient specially in night time while taking rest.

NO is generated by nitric oxide synthase (NOS) which acts via 10000-fold effect to reverse the neuronal damage.

**Methods:** 32-year-old female complaints of back of neck pain for 2 months then bilateral calf muscle night rest cramps from 1.5 months. GCS E54V5M6, cranial nerves normal. Motor examination showed left Hoffman was positive, right Hoffman was negative, superficial and deep tendon reflexes are normal. ASIA grading done in motor, sensory and bladder bowel involvement which all were normal. Motor, normal nutrition of upper limbs and lower limbs both sides with tone and all reflexes. Sensory examination is showing 224/224 (all over body normal) without bladder bowel involvement. MRI of cervical spine showed myelopathic changes with MRI of brain normal without any significant findings in rest of the cranial spinal axis. AL-TENS has been done which showed normal on all limbs.

**Results:** Patient didn't have any muscle cramps since the day of ITSNP until now (2 months).

**Conclusions:** This case was well diagnosed as MYELOPATHY with night muscle cramps and after giving ITSNP to induce the 10000-fold effect got 75% improvement on 15<sup>th</sup> day of post ITSNP phase.

## Paediatric

Oral presentation

The 10,000-fold-effect of retrograde neurotransmission-a new concept for cerebral-palsy revival: use of nitric-oxide-donors (intrathecal sodium nitroprusside and oral tadalafil)

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**Objectives:** Intrathecal sodium nitroprusside to activate the 10000-fold effect to modulate the retrograde neuroregulation in CEREBRAL PALSY cases.

**Background:** NITRIC-OXIDE-DONORS (NODs) (Intrathecal Sodium Nitroprusside (IT SNP) and oral tadalafil) studied here in cerebral palsy (CP). This work proposes three mechanisms for cerebral palsy cases, which are interrelated, for swift physiological recovery.

1. RETROGRADE NEUROTRANSMISSION:

A) Normal excitatory impulse: at the synaptic level, glutamate activates NMDA receptors, with nitric oxide synthetase (NOS) on the postsynaptic membrane, for further propagation by the calcium-calmodulin complex. Nitric oxide (NO, produced by NOS) travels backward across the chemical synapse and binds the NO receptor at presynaptic neuron, regulating anterograde neurotransmission (ANT) via retrograde neurotransmission (RNT). Heme is the ligand-binding site of the NO receptor. Heme exhibits > 10,000-fold higher affinity for NO than for oxygen (the 10,000-fold effect).

B) Pathological conditions: normal synaptic activity, including both ANT and RNT, is absent. NO donors release NO from NOS at the postsynaptic region generates an impulse, same as under normal conditions.

2. VASOSPASM: Perforators show vasospastic activity. NO vasodilates it via NO-cAMP pathway.

3. LONG-TERM-POTENTIATION (LTP): The NO-cGMP-pathway plays a role in LTP at many synapses throughout the CNS and at the neuromuscular junction for memory/learning.

**Methods:** 60 random CP {30 control without NOD or with 5% dextrose superfusion, and 30 patients (irrespective of etiology) comprised the NOD group in which ITSNP and oral tadalafil 0.2 mg per kg/bo/wt per alternate days for 3 months was given}. The mean age for superfusion was 3.75 years. Pre- and post-NOD status was monitored by GMFM-66 with videography and MRI studies.

**Results:** the mean increase in GMFM-66 at Post 7 days (37.29%) and 3 months (37.15%) in the NOD group, than control-group increase of 0% at 7 days or 3 months.

**Conclusions:** NOD-ITSNP boosts-up the recovery and oral tadalafil maintains the recovery.

## Trauma

ePoster presentation

### Assessment of cognitive function in mild traumatic brain injury with Wisconsin Card Sorting Test

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**Objectives:** To explore the cognitive dysfunction in patients with mild traumatic brain injury (mTBI).

**Background:** TBI is an important cause of injury-related morbidity and mortality in adults. Common acute manifestations of TBI include dizziness, headache, cognitive deficits, and emotional problems. Cognitive deficits are often the most disabling and distressing for the affected persons, family members, and society. This study compared the cognitive function performance between mTBI and health control.

**Methods:** 295 mTBI patients agreed to join and completed all questionnaires. The inclusion criteria were 20-70 years old, head injury within two weeks, Glasgow Coma Scale >12, and loss of consciousness in less than 30 minutes. The participants with a history of head injury, epilepsy or pregnancy were excluded. 200 health control volunteers with no history of head injuries were recruited. Wisconsin Card-Sorting Test-64 (WCST-64) is an instrument to evaluate cognitive function. The mean difference between two groups was compared via student T-tests and Chi-Square tests for continuous and categorical variables.

**Results:** The percentage of female participants and the average education years between two groups were statistically significantly different, but the average age between two groups was not significantly different (mTBI: 44.3±14.12, control: 44.08±14.96), 184 (62.37%) female in mTBI and 136(68%) female in control. The average raw scores of five indices (Total error, Perseverative response, Perseverative error, Non-Perseverative error, trial for completed first category) in the mTBI group were larger (worse) than those in the health control group. On the other hand, the average standardized scores of these five indices in the mTBI group were smaller (worse) than those in the health control group.

**Conclusions:** 7 of 10 WCST raw scores significantly differed between mTBI and health control groups after adjusting by age and education level. The performance of WCST in the mTBI group was worse than that in the health control group.

## Trauma

ePoster presentation

Is brain death reversal possible in near future: intrathecal Sodium Nitroprusside (SNP) superfusion in brain death patients = the 10,000 fold effect

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**Objectives:** To study the effect of 10000 FOLD EFFECT BY ITSNP in cases of brain death.

**Background:** Primary or secondary brain death is accompanied with vasospasm of the perforators thus decreasing blood supply in turn it causes absence of brain function. The perforators are having Nitric Oxide Synthetase which is present at the outer border or the adventitial side on which sodium nitroprusside (SNP) acts, causing release of Nitric Oxide which vasodilates the perforators causing gush of blood thus reverting the brain's function and the effect of retrograde transmission, is mediated by NO's action on haem group of the NO receptor at postsynaptic membrane. This affinity of haem for NO is >10,000 affinity then affinity of hemoglobin for oxygen of blood (THE 10,000 FOLD EFFECT). Thereby we get such a prompt response.

**Methods:** 35 year old male, who became brain death after head injury and has not shown any signs of improvement after every maneuver for 6 hours, a single superfusion done by SNP via transoptic canal route for quadrigeminal cistern and cisternal puncture for IV ventricular with SNP done.

**Results:** He showed spontaneous respiration (7 bouts) with TCD studies showing start of pulsations of various branches of common carotid arteries.

**Conclusions:** In future we can give this SNP via transoptic canal route and in IV ventricle before declaring the body to be utilized for transplantations or dead or in broader way we can say that in near future it is possible to revert back from brain death or we have to modify our criterion.



## Global Neurosurgery

Oral presentation

Geographical distribution of neurosurgeons and emergency neurosurgical services in Pakistan

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**Objectives:** Our objective was to geographically map the density of neurosurgeons and emergency neurosurgical services (ENS) in Pakistan.

**Background:** Access to healthcare is a fundamental universal right. According to the World Federation of Neurosurgical Societies (WFNS), a minimum neurosurgery workforce density should be 1 per 200,000 population for optimum access to neurosurgical care. Despite being the fifth most populous country, Pakistan lags behind in the number of neurosurgeons, and disproportionate geographical distribution further increases disparity.

**Methods:** This was a cross-sectional survey, circulated among the 329 qualified neurosurgeons listed in the Specialists Register of the country. Surgeons were contacted via personal and professional networks through emails and phone calls, and snowball technique was applied to increase responses. The number of neurosurgeons and ENS were plotted on the population density map using ArcGIS Pro 3.0.0 software.

**Results:** Three hundred and seven neurosurgeons working at 74 centers responded to our survey (93.3% coverage). The density of neurosurgeons in Pakistan is 0.14/100,000. The two more populous provinces, Punjab and Sindh, have 42.3% (130) and 35.8% (110) neurosurgeons, respectively. These two provinces also house nearly 3 quarters of all the neurosurgery centers in urban districts. Two largest cities, Karachi and Lahore, accommodate 135 (44%) of all the country's neurosurgeons, having 0.29 and 0.51 neurosurgeons/100,000, respectively. Management of traumatic brain injury is being offered at 65 centers (87.8%). Nearly all centers are equipped with CT scan machine (74; 97%), MRI is available at 55 (72%) centers and 37 (49%) centers have angiography suites. Sixty nine hospitals (93.2%) have C-arm fluoroscopes, while only 53 (71.6%) have an operative microscope available.

**Conclusions:** The geographical mapping of neurosurgeons and neurosurgical facilities is highly skewed towards urban centers, increasing disparity in access to timely neurosurgical emergency services. Four times more neurosurgeons are required in Pakistan to bridge the gap in neurosurgical workforce.

## Global Neurosurgery

ePoster presentation

Impact of the COVID-19 pandemic on the activity of neurosurgery department at Ibn Tofail Hospital, Mohammed VI UHC, Marrakesh

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**Objectives:** The objective of our study is to assess the impact of the pandemic on the activity of Neurosurgery department at the Ibn Tofail Hospital at the university hospital Mohammed VI of Marrakech.

**Background:** In 2020, the corona virus pandemic caused an unprecedented global crisis. Health care systems have found themselves faced with a colossal challenge, both to deal with the new virus and to keep a minimum of care for other pathologies. Faced with this situation, several Neurosurgery societies have published recommendations to ensure the continuity of Neurosurgery services.

**Methods:** This is a retrospective and descriptive study in the medical oncology department over a period of 36 months from 2018 to 2020. An analytical comparison was made of the results of 2020 with previous years (2018-2019).

**Results:** We noted a drop in diagnostic activity in 2020 compared to 2018/2019. And also an important drop in therapeutic activity in 2020 compared to 2018/2019. This decline was most pronounced in the 2nd quarter of 2020.

**Conclusions:** The Covid-19 pandemic has impacted all spheres of our lives. In neurosurgery, the patient has seen his journey of care disturbed and his treatment delayed. Only time will be able to elucidate all the consequences of this pandemic on neurosurgery pathology.

## Hydrocephalus

Oral presentation

### Shunts in idiopathic intracranial hypertension

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#### Objectives:

1. To study shunt survival in patients with idiopathic intracranial hypertension (IIH) who have undergone ventriculo-peritoneal (VP) and lumbar-peritoneal (LP) shunting.
2. To identify risk factors associated with shunt failure.

**Background:** Shunts are an essential tool in the management of IIH patients who have deteriorating vision.

**Methods:** All VP and LP shunts performed consecutively in a single tertiary center were reviewed. 13 different demographic and clinical variables were collected from the electronic clinical portal. Data were analysed utilising Kaplan Meier and Cox Regression analysis.

**Results:** 147 operations were performed on 55 adult IIH patients. The median age was 31 years with the majority (96.3%) being female. There were 74 cases of LP shunts and 72 cases of VP shunts and the median survival for all IIH shunts was 355 days. The duration of surgery was shorter for LP shunts (1.07 hours). 47% of shunts placed had a programmable valve but 45% of LP shunts had no valve inserted. 11 LP shunts were subsequently converted to VP shunts while only 3 VP shunts were converted to LP shunts. VP and LP shunts had similar consultant involvement ( $p=0.3$ ) during insertion. The incidence of malpositioned distal catheters in VP shunts was higher (26%) than in LP shunts (13%). However, LP shunts (30%) had a higher shunt disruption rate compared to VP shunts (7.1%). Patient age (Hazard-ratio 0.71,  $p=0.005$ ), and operation duration (Hazard-ratio 0.66,  $p=0.016$ ) were independently associated with shunt survival. There was no difference in shunt survival between VP or LP shunts ( $p=0.53$ ).

**Conclusions:** In our unit LP and VP shunts are used in almost equal frequency and have similar survival rates. Indication to use LP or VP shunts depends on surgeon preference and the size of the lateral ventricles.

## Oncology

ePoster presentation

### A novel single centre experience with real-time Navigated Intraoperative Ultrasound (NiUS) in multifocal brain tumors

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**Objectives:** Multicentric and multifocal intrinsic tumours remain a surgical dilemma, accessing satellite nodules safely in the event of a shifting brain can prove technically challenging. We assessed the use of BrainLab® navigated intraoperative ultrasound (NiUS) and novel “Snap” to MRI ultrasound registration on the extent of resection.

**Background:** Real-time navigated ultrasound potentially improves lesion detection and analysis compensating for brain shift. With “Snap” to MRI, each sequential NiUS image set corrects distortion to rigid structures. This feature is particularly valuable in multifocal-multicentric lesions, as fixed structures can be re-registered in real-time, improving the accuracy of the navigational system.

**Methods:** We prospectively collected data on 15 patients who underwent surgery for brain tumours using navigated ultrasound at a single centre. Five patients demonstrated multifocal lesions and real-time intraoperative re-registration was performed using NiUS and “Snap” to MRI. The analysis included demographics, tumour location, histology, diagnostic accuracy, the extent of resection, and related factors influencing this. BrainLab neuronavigation and the BK 5000 cranial ultrasound probe were used in all cases.

**Results:** NiUS with real-time MRI fusion was used in 15 patients. All patients were successfully registered to the MRI, however, five (5) with multifocal lesions iUS scans were successfully co-registered after resection of the larger first lesion. The rate of gross total resection of patients with multifocal lesions was 100%. Histological diagnoses were Astrocytoma WHO Grade 4 - (7), Metastatic Carcinoma – (5:- 3 colorectal, 1 pancreatic, 1 lung), Astrocytoma Grade 3 (1), Astrocytoma Grade 2 (1) and Anaplastic Oligodendroglioma Grade 3 (1). NiUS was used in conjunction with Diffuse tensor imaging DTI (15), 5 aminolevulinic acid (7), neurophysiology (5), and awake craniotomy (4). No intraoperative complications were recorded.

**Conclusions:** Our early experience with the use of NiUS with “Snap” to MRI fusion has been beneficial in multifocal high-grade gliomas and metastases. NiUS has been incorporated into our surgical workflow allowing rapid correction for intraprocedural brain shift thus having the potential to improve the accuracy of targeting additional lesions and the extent of resection.

## Oncology

ePoster presentation

### Preservation of facial nerve in large/giant vestibular schwannoma

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**Objectives:** Methods to preserve facial nerve in large and giant vestibular schwannoma.

**Background:** Preserving the facial nerve function in vestibular schwannoma surgery is challenging. General strategies like approach, intraop monitoring, meticulous dissection, using high-powered microscopes etc have been well documented.

**Methods:** Recent advances using gamma knife (GK) has well documented long term results in management of these tumours. Every surgeon wants to achieve total excision and this peer pressure leads to more chances of facial nerve damage. The idea of leaving some tumour behind is frightening, yet is a viable option, which can be subjected to gamma knife later. We resect tumour under continuous monitoring and stop where facial nerve is unidentifiable or too precarious to dissect safely.

**Results:** We operated 25 such large vestibular schwannomas in last three years. The average size was 4.8 cm. 5 patients needed pre op shunt. All patients had intra op nerve stimulation for monitoring. Gross total tumour excision was achieved in 10 (40%) patients, where as in 15(60%) patients had some residual tumour (which was left behind to save facial nerve). This strategy resulted in preserved 7<sup>th</sup> nerve function grade 2 or better at 3 months follow up in 22 patients (88%), grade 3 in 2 and grade 4 in one. There was no mortality and no other significant morbidity. Out of 15 patients with residual tumour, 10 needed, GK for small residual tumour, in 5 patients the tumour was too small to consider for GK, hence planned to follow up. The singular factor responsible for good 7<sup>th</sup> nerve preservation in these large tumours was, intraoperative decision to do near total resection for sake of preserving 7<sup>th</sup> nerve.

**Conclusions:** Near total excision of VS followed by GK, is an very important and viable alternate option in new era of advancement in technology.

## Oncology

ePoster presentation

### The semi-sitting position in posterior cranial fossa tumor surgery in children

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**Objectives:** To evaluate the morbidity, surgical practicability, and results of a monocentric, consecutive series of children undergoing elective surgery in the semi-sitting position for pediatric posterior cranial fossa tumor (PCFT).

**Background:** The use of the semi-sitting position remains a controversial issue, despite several obvious surgical advantages compared to the prone or lateral position. This aspect is even more debated in PCFT surgery. The primary matter is the risk of venous air embolism (VAE) and related complications.

**Methods:** Clinical data, charts, neuroradiological images, and intraoperative notes of a consecutive series of children operated on at our Institution from 2008 to 2022 for PCFT were collected. All patients were managed perioperatively according to a standard institutional protocol, stepwise positioning, and surgical maneuvers to decrease the risk of VAE and other complications.

**Results:** All patients were preoperatively screened for patent foramen oval with transcranial Doppler with microbubbles. Among 68 children admitted to our Institution for PCFT, 64/68 (94%) were operated in the semi-sitting position; the remaining four were in the prone position. The mean age was 8.12 years: 27 children were under 8, and only two were under one year. No complications were directly related to the position. The incidence of intraoperative VAE was 14%: surgery was completed in all cases, and only in one child was a change of operative position necessary. Pneumocephalus, radiologically more evident in the semi-sitting position, never required treatment. Postoperative skull fracture and epidural bleeding due to the skull clamp application were never reported.

**Conclusions:** Even in the case of intraoperative VAE, the semi-sitting position did not increase the risk of morbidity, and it appears to raise the resection rate. Key points to consider in children are different body proportions, large head and short neck, pins size, and variability in anatomical and functional closure of oval foramen.

## Spine

ePoster presentation

### Effect of axial and sagittal radiological cord compression on clinical myelopathy in Nigerians with degenerative cervical myelopathy

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**Objectives:** To determine the cervical cord axial and sagittal dimensions using compression ratio (CR) and maximum spinal cord compression (MSCC) respectively across varying severity of clinical myelopathy in Nigerians with degenerative cervical myelopathy (DCM).

**Background:** The severity of clinical myelopathy in DCM is often inconsistent with degree of radiological spinal cord compression. This has led to delay in recognition and referral of patients with severely compressed cord to a specialized neurosurgical centre, ultimately affecting the prognosis after treatment. No study has been done to determine how the degree of degenerative cervical cord compression affects the severity of symptoms among Nigerians.

**Methods:** A prospective, cross-sectional, MRI-based clinical study, conducted on Nigerian patients who presented to the study centre for evaluation and management of DCM. The CR and MSCC at most compressed cord levels were assessed. The modified Japanese Orthopaedic Association (mJOA) score was obtained for each patient and graded into mild, moderate or severe myelopathy. The relationship between the cord dimensions and grades of myelopathy was determined. Patients with traumatic cervical cord injury, cervical tumour, cervical syrinx, spinal anomaly, prior surgical intervention, cerebrovascular accident, demyelinating disease were excluded from the study. The data were analysed using descriptive and inferential statistics.

**Results:** Sixty patients were enrolled with a M:F ratio of 3:1, and a mean age of 63.2±2.6 years. The mean CR and MSCC scores were 34.9±3.5% and 31.4±4.5% respectively. Fifty-three percent of patients had severe myelopathy (mJOA < 12). The CR decreased while MSCC increased with worsening grade of myelopathy. Significant difference was observed between the groups, which was shown through post hoc analysis to exist between the mild and severe grades of myelopathy only (p=0.027 and 0.038 for CR and MSCC respectively).

**Conclusions:** The severity of myelopathy is negatively related to CR but positively related to MSCC in Nigerian patients with DCM.

## Hydrocephalus

ePoster presentation

The infected shunts: a single-centred 10-year retrospective study

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### Objectives:

1. A retrospective analysis of all infected shunts over a 10-year period.
2. To identify predictive factors for shunt infection.

**Background:** Shunt surgery is one of the most effective neurosurgical endeavors. However, these procedures carry moderate risk, with shunt-associated infection being one of the more common causes of shunt failure.

**Methods:** We reviewed all shunts performed consecutively in a ten-year period. 13 different clinical variables were identified from the electronic clinical portal. Data was analysed utilising Kaplan Meier and Cox Regression analysis.

**Results:** 969 shunt operations were performed in 519 patients; 76 (7.8%) shunts were infected. 38 (50%) shunts were found to be infected within 20 days of shunt insertion. A shunt revision was performed in 93 infected shunts. 86% (80) of infected shunt systems were completely removed and replaced temporarily with an EVD. The median duration of EVD drainage was 8 days. 63%(59) of infected shunt taps yielded growth on culture. The 2 most common causative micro-organisms were Staphylococcus aureus (16 cases, 27%) and Staphylococcus epidermidis (17 cases, 29%). Shunt infection was related to out-of-hour operation (Hazard-ratio 2.5,  $p<0.001$ ), surgery duration (Hazard-ratio 1.4,  $p=0.028$ ), shunt revision (Hazard-ratio 2.4,  $p<0.001$ ), patient age (Hazard-ratio 0.98,  $p=0.01$ ), and malformation aetiology of hydrocephalus (Hazard-ratio 2.15,  $p=0.015$ ).

**Conclusions:** Our study has shown that shunt infections are likely to occur within a month of insertion. Factors influencing shunt infection were identified and it is hoped that modifying these will result in reduced rates of infection.



## Hydrocephalus

Oral presentation

Ventriculoperitoneal Shunt – the workhorse of CSF surgery

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### Objectives:

1. To study the natural history of primary and revisional ventriculoperitoneal shunts (VPS).
2. To identify factors associated with VPS survival.

**Background:** VPS is the most common shunting technique in neurosurgery. Despite the commonality of this technique, it is still fraught with complications.

**Methods:** We reviewed all the VPS performed in the last ten years in a single tertiary centre. 15 different variables were obtained from the electronic clinical portal. Statistical analysis was performed using student t-test and Fisher's exact test, Kaplan Meier survival analysis, and Cox Regression.

**Results:** 788 VPS were performed in 460 patients. The most common indication for VPS was hydrocephalus secondary to an acquired aetiology. Most VPS insertions were performed by trainees (59%) using a freehand (62%) technique for ventricular cannulation. 49% of cases were undertaken by two surgeons. The most common reason for VPS failure was under-drainage (44%) and this was true for both primary (36%) and revisional (49%) VPS cases.

Primary VPS (one-year survival: 72.7%) had a better survival rate than revisional (55.2%) VPS ( $p < 0.001$ ), and the mean survival duration for primary and revisional VPS were 385.4 and 276.8 days. VPS performed for an acquired hydrocephalus aetiology (69.1%) had a better survival rate than those with either idiopathic (55.9%) or malformation aetiology (51.4%) ( $p < 0.001$ ). VPS insertions that were completed with two surgeons scrubbed had a better survival rate than those done by a single solo surgeon ( $p = 0.005$ ).

Poorer overall shunt survival was related to operations performed during out-of-hour (HR1.54,  $p < 0.001$ ), revisional VPS (HR1.85,  $p < 0.001$ ), malformation/idiopathic hydrocephalus aetiology (HR1.71,  $p < 0.001$ ; HR1.43,  $p = 0.02$ ), and age (HR0.97,  $p < 0.001$ ).

**Conclusions:** Factors contributing to a higher shunt failure rate were identified and this study has demonstrated that revision VPS surgery has high failure rate. Performing shunt surgery within working hours with 2 surgeons might reduce the failure rate. A further prospective study is needed.

## Spine

Oral presentation

### Minimally invasive posterior approach for surgical treatment of craniovertebral junction meningiomas: a single center experience

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**Objectives:** To describe our experience of surgical treatment of craniovertebral junction meningiomas using a minimally-invasive posterior approach.

**Background:** Surgical treatment of extramedullary tumors affecting the region of the craniovertebral junction is one of the most difficult problems in modern neurosurgery. Despite the extensive and comprehensive development of this problem, a single universal approach to the surgical treatment of this nosology of neoplasms has not been formed.

**Methods:** At the Burdenko Neurosurgical Center in the period from 2016 to 2021, 61 patients (13 men, 48 women) underwent surgical removal of meningiomas of the craniovertebral junction. The mean age of the patients was 58 years (40-66 years). The patients were divided into 2 groups: group I consisted of 32 patients operated on with the classical open surgical approach; Group II consisted of 29 patients operated on with a minimally invasive surgical approach. The Frenkel,

Karnofsky, VAS, neurological status and control MRI scales were used to assess patient outcomes.

**Results:** Patients in group II postoperatively had lower VAS scores (average difference between groups was 4 points), lower need for postoperative analgesia, shorter hospital stay (average hospital stay for group I - 6 days, for group II - 3 days) with a similar percentage of radical removal and Frenkel scale indicators.

**Conclusions:** Minimally invasive surgical approach in the treatment of craniovertebral junction meningiomas allows for complete tumor resection with lower intraoperative soft tissue and muscle trauma based on postoperative MRI findings, lower postoperative pain, lower analgesic consumption, and shorter hospital stay compared to classical open surgery.

## Global Neurosurgery

Oral presentation

A novel SMS-based follow-up technology for the remote assessment of global outcome following traumatic brain injury: a pilot evaluation

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**Objectives:** To determine concurrent (criterion) validity of a modified GOS-E, the Short-Form Extended Glasgow Outcome Scale (SFGOS-E), delivered through a novel, SMS-based (short message service) follow-up technology (FUT) for traumatic brain injury (TBI) patients, and to explore follow-up completeness using this technology.

**Background:** More methodical, industrious processes for follow-up and injury surveillance are necessary for TBI patients. This evaluation sought to investigate the completeness of remote SMS follow-up and assess the validity of a novel, short-form patient-reported outcome measure (SFGOS-E) derived from the Glasgow Outcome Scale Extended (GOS-E).

**Methods:** Single-centre pilot service evaluation conducted between March 2021 and October 2022. The 6-item SFGOS-E was derived to include items from the GOS-E with recovery status labels attached to them. Participants received a traditional baseline GOS-E, then autonomously re-interviewed with the SFGOS-E through the FUT. Criterion validity between mediums was assessed through the kappa statistic.

**Results:** Thirty-six patients of varying injury severity participated. 14 patients (38.9%) did not complete the SFGOS-E, depicting a completion rate of 61.1% (n = 22). Of those that completed the SFGOS-E, 15 (68.2%) responded on the first attempt, with the remaining seven (31.8%) responding on the second. Possible attrition agents were assessed (age, sex, injury severity, baseline GOS-E, and time since injury), though none were found to be statistically significant. Where baseline GOS-E and SFGOS-E outcome categories were available (n = 20), linear and quadratic weighted kappa values of 0.79 and 0.93 were achieved, respectively.

**Conclusions:** Our evaluation demonstrated good criterion validity between measures, suggesting that this novel technology may be used to autonomously garner an assessment of patient status following injury. The novel FUT may hold further potential in a variety of global settings by providing a 'digital bridge' to overcome communication gaps between outpatient appointments, enabling clinicians to collect temporally sensitive data away from the hospital setting.

## Spine

ePoster presentation

### Intramedullary spinal cord tumor surgery guided by intraoperative neuromonitoring: a surgeon's perspective

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**Objectives:** To analyse and describe the use of intraoperative neurophysiological monitoring in intramedullary spinal cord tumor surgery based on literature data and vast clinical experience.

**Background:** Intramedullary spinal cord tumors (IMSCTs) are rare, predominantly benign tumors arising from glial and ependymal cells, accounting for about 2% of all tumors of the central nervous systems and 20-30% of all spinal cord tumors. Intramedullary tumors can lead to severe neurological deficit in the form of motor and sensory disorders, decrease and loss of conductive function, which leads to a significant decrease in quality of life or even death. Surgery remains the mainstay treatment. Taking into account modern surgical methods, wide knowledge and treatment experience in most cases complete or maximally safe tumor resection can be achieved. Radical resection has been associated with increased long-term overall survival; however, surgery might cause damage to functional tissue, which leads to neurologic complications. Despite advancements in neurosurgical techniques and assistive devices, IMSCT resection still carries a considerable risk for neurological deterioration, reaching as high as 90% in the immediate postoperative period. To mitigate the exceedingly high neurological deterioration rates associated with excision of intramedullary tumors, use of intraoperative neurophysiological monitoring (IONM) has become an imperative adjunct to their resection.

**Methods:** A thorough literature analysis on IONM in intramedullary spinal cord tumor surgery was performed. The data was compiled and correlated with the authors experience of treating more than 1000 cases of IMSCT's.

**Results:** Presentation contains a view on intramedullary spinal cord tumor surgery guided by neuromonitoring from a surgeon's perspective based on current evidence-based data and vast experience, the pros's and con's of using neuromonitoring are discussed.

**Conclusions:** Surgery for IMSCT continues to be challenging, but IONM has remarkably impacted surgical management of these tumors and there is increasing evidence that its role to prevent or minimize neurological morbidity.

## Education, Ethics, Socioeconomic

Oral presentation

Update on the development of a clinical practice guideline for patients with chronic subdural haematoma and translation to other settings

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**Objectives:** 1. To report on the development of multidisciplinary clinical practice guidelines for the care of patients with chronic subdural haematoma (cSDH) in the UK.

2. To outline plans for translation to other international settings.

**Background:** cSDH is a common neurosurgical condition. A significant proportion of patients are frail, medically complex, take anti-thrombotic medications, and require significant perioperative input. No specific guidelines exist to define best practice in caring for this patient cohort. We report on current efforts and next steps in developing multidisciplinary guidelines for cSDH in the UK and plans to validate these in international settings.

**Methods:** We formed five working groups to examine specific facets of cSDH care. These included; natural history, non-operative management, perioperative optimisation, surgery, and rehabilitation. Working groups defined clinical questions that informed a systematic literature search (Medline, EMBASE) from inception to June 2022. This included an umbrella review of currently existing systematic reviews. Our multidisciplinary steering group iteratively drafted clinical practice recommendations that will be ratified in a nationwide (UK) Delphi.

**Results:** Working groups defined 44 key clinical questions. Feedback on these was obtained from patient and carer representatives. An umbrella review identified that current systematic reviews poorly mapped to identified themes. Our steering committee created 85 draft recommendations for a future clinical practice guideline. Following ethical approval a UK wide Delphi of healthcare professionals will launch in June 2023 to refine these statements and inform guideline contents. We are convening a specific working group to explore applicability and translation of our final recommendations to other international settings. This will occur alongside work to design implementation strategies for the guidelines in UK practice.

**Conclusions:** We report on progress on developing multidisciplinary guidelines for patients with cSDH. Following finalisation of our UK guideline we will explore the applicability of our findings to other settings with an international working group.

## Spine

Oral presentation

### Surgical treatment of intramedullary spinal cord tumors: experience of more than 1000 cases

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**Objectives:** To describe our experience of surgical treatment of intramedullary spinal cord tumors of various histological types.

**Background:** Intramedullary spinal cord tumors (IMSCTs) are rare, predominantly benign tumors arising from glial and ependymal cells, accounting for about 2% of all tumors of the central nervous systems and 20-30% of all spinal cord tumors. Intramedullary tumors can lead to severe neurological deficit in the form of motor and sensory disorders, decrease and loss of conductive function, which leads to a significant decrease in quality of life or even death. Surgery remains the mainstay treatment. We describe our experience of treatment of more than 1000 cases of intramedullary spinal cord tumors, our opinion on using intraoperative metabolic navigation and laser spectroscopy and our algorithms for surgical treatment of various types of intramedullary tumors.

**Methods:** A thorough literature analysis on IONM in intramedullary spinal cord tumor surgery was performed. The data was compiled and correlated with the authors experience of treating more than 1000 cases of IMSCT's. All patients underwent microsurgical tumor resection with application of ultrasound suction device and electrophysiological monitoring. In some cases, we used a metabolic navigation from 5-aminolevulinic acid to precisely identify the borders of astrocytomas (Grade II, III, IV). This allowed us resections tumors more radically with minimal postoperative deficits. McCormick scale was used for evaluation neurological status.

**Results:** Presentation contains our data on surgical of more than 1000 cases of intramedullary spinal cord tumors, our opinion on using intraoperative metabolic navigation and laser spectroscopy and our algorithms for surgical treatment of various types of intramedullary tumors.

**Conclusions:** Surgery for IMSCT continues to be challenging due to the rarity of this disease, the high functional relevance of the spinal cord, and the consequent risk of inducing severe neurological deficits.

## Paediatric

Oral presentation

### A pooled analysis of management and outcomes in pediatric infectious intracranial aneurysms

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**Objectives:** To evaluate presentation, radiographic features and outcomes in pediatric infectious intracranial aneurysms (IIAs).

**Background:** IIAs are rare complications of systematic infection and most commonly associated with infective endocarditis (IE). Data on management of IIA remains limited to small case series and case reports.

**Methods:** We completed a systematic review of published cases of pediatric IIA in English language using MEDLINE and SCOPUS database from 01/1950 to 03/2023. Patient demographics, aneurysm features, management paradigm and outcomes were curated. Outcome measures included treatment failure and mortality.

**Results:** We included 78 studies reporting 150 patients with 191 IIAs. IE was the most common predisposing factor in all pediatric patients (53%), but the most common factor in infants (<2 yo) was CNS infection. Staph Aureus was the most common pathogen isolated (20%). Most aneurysms occurred in MCA branches (53%), and 20% occurred in the posterior circulation. Multiple concurrent aneurysms were reported in 18%. Patient presented with rupture in 63%. On multivariate analysis, predictors of rupture at presentation included IE (aOR=3.1, 95%CI:1.05-9) and posterior circulation (aOR=9, 95%CI:1.1-79) whereas age or size were not predictors. Primary medical management was used in 49% of cases, endovascular management in 14% and microsurgery in 37%. In the medical group, the rate of treatment failure defined as aneurysm progression or rupture was 58% compared to 14% with endovascular management and 0% with microsurgery. On multivariate regression, failure of medical management was an independent predictor of 1 year mortality (aOR=4.8, 95%CI:1.5-15) along with rupture at presentation (aOR=8.2, 95%CI:1.9-35). The rate of 1 year mortality was 27% (38% in ruptured IIAs versus 8% in unruptured, p<0.001).

**Conclusions:** IIAs are a rare cause of intracranial hemorrhage in the pediatric population. Primary medical management is associated with high rate of failure leading to worse outcomes. Endovascular and microsurgical management should be considered early in eligible patients.

## Hydrocephalus

Oral presentation

Comparison of surgical outcomes of ventriculoperitoneal versus lumbar-peritoneal shunts in managing intracranial hypertension secondary to cryptococcal meningitis in HIV-infected patients

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**Objectives:** The purpose of the study was to compare the surgical outcomes of ventriculoperitoneal shunts (VPS) versus lumbar peritoneal shunts (LPS) used for cerebrospinal fluid (CSF) diversion in HIV-infected adult patients diagnosed with refractory intracranial hypertension (IH).

**Background:** Cryptococcal meningitis (CM) is an AIDS-defining disease associated with increased morbidity and mortality. Refractory intracranial hypertension is a common finding among these patients.

**Methods:** Retrospective data were collected for 60 patients treated with VPS and 23 patients treated with LPS between January 2003 and January 2015. All were HIV-infected adult patients diagnosed with refractory IH secondary to CM. We compared baseline demographics, clinical characteristics, laboratory results, CD4 count, CSF results, and neuro-radiology findings. The primary outcomes were shunt complications and in-hospital mortality.

**Results:** The baseline age distribution was similar between the two groups. Males were the majority in both groups, 61,7% (VPS) vs 56,5% (LPS). Radiological features of hydrocephalus were diagnosed in 92% of patients treated with VPS compared to 57% treated with LPS ( $p=0,56$ ).

Shunt complications occurred in 17 (28%) patients treated with VPS compared to 10 (43.5%) treated with LPS ( $p =0.5$ ). The median CD4+ in patients who developed shunt complications was 117 cells/ $\mu$ l (VPS) and 48 cells/ $\mu$ l (LPS) ( $p=0.03$ ). The mean lengths of stay were 6.2 days (VPS) and 5.3 days (LPS) respectively. Three (5%) patients treated with VPS died compared to two ((9%) treated with LPS ( $p=0.48$ ).

**Conclusions:** In our series, radiological features of hydrocephalus appear to be a determining factor when choosing the shunt option. The shunt complication rate was higher in patients treated with LPS; however, this was not statistically significant. CD4 count of less than 200 cells/ $\mu$ l was associated with shunt complication in both groups. The length of stay and mortality rates were comparable between the two groups.



## Global Neurosurgery

ePoster presentation

### Healthcare associated infections in the neurosurgical department of Gabriel Toure Teaching Hospital in Bamako

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**Objectives:** The aim of this study was to determine the frequency of healthcare-associated infections (HAIs) and to identify the risk factors associated with these infections.

**Background:** HAIs are a public health problem due to their frequency, severity and economic impact. They cause an increase of morbidity, mortality, hospital stay and expenses of taking care of the patients. According to the WHO, 7.1 million people are affected each year, of which about 100,000 die.

**Methods:** This was an epidemiological, descriptive, analytic, cross-sectional and prospective study lasting 6 months from May 29 to November 30, 2016. The maximum size of the sample was 200 patients. A sample was taken for each type of infection. The criteria used for the diagnosis of Healthcare-associated infections were those of the CDC. The chi-square test was used for the comparison of qualitative variables and Kruskal Wallis and Anova for quantitative variables. The materiality threshold has been set to a value of p less than 0.05.

**Results:** We had 34 infected patients out of 200, a rate of 17%. The significant risk factors found in our study were: high age (p = 0.04), ASA class (p = 0.002), pre-surgical shaving (p = 0.02), long duration surgical intervention (p = 0.002) and long hospital stay (p = 0.004). The types of infections found were: urinary in 18 (53%) cases, respiratory in 9 (26%) cases, operative site in 6 (18%) cases and 1 (3%) cases of bacteremia. The bacterial spectrum of these infections was dominated by Negative Gram Bacilli, among which Escherichia coli in 11 (32.3%) cases. The mortality rate was 2.9%.

**Conclusions:** The prevalence of Healthcare-associated infections in our department remains high compared to that found in developed countries. This study allowed us to identify the main risk factors associated with these infections.

## Trauma

ePoster presentation

A bread and butter for neurosurgeons with varieties of cheese - a chronic subdural haematoma

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**Objectives:** To analyse the different etiology of chronic subdural haematoma which we deal in our daily practice.

**Background:** Patients with chronic subdural hematoma (CSDH) typically present with symptoms of increased intracranial pressure, including headache, vomiting, drowsiness, or contralateral weakness. 1.72 to 20.6 per 100,000 persons per year. The most common causes are Head injury, old age, Coagulopathy, idiopathic intracranial hypotension and alcohol abuse. Rarely Pachymeningitis may mimic Chronic subdural haematoma. Non-traumatic subdural hematoma (SDH) caused by intracranial arteriovenous fistula (AVF) is rare.

**Methods:** We retrospectively analysed 9 Patients of chronic subdural Haematoma operated in our center over last one year considering Age, sex, demographic data, Radiological images and personal habits.

**Results:** Of 9 patients, 5 underwent craniotomy and 4 underwent Burr hole. One patient during intra-operatively, dura was thickened and with no subdural haematoma intraoperatively, Dural Biopsy was done which reported as Pachymeningitis and Culture was reported as H. influenza. Another patient who underwent a burr hole again presented with GTCS after 2 months and MRI Brain was done which showed Dural AVM and Endovascular embolization was done.

**Conclusions:** Awareness of the potential for these presentations of chronic subdural haematoma may be useful in early diagnosis and better results.

## Spine

ePoster presentation

### Endoscopic surgery for lumbar disc herniation - our experience

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**Objectives:** The endoscopic technique shows a similar surgery success and additional several advantages, especially shortening of physiotherapy. University Hospital Brno is the first in Czechia, conducting endoscopic lumbar herniectomy since 2017. In this article, we present our first experiences.

**Background:** The endoscopic technique shows a similar surgery success and additional several advantages, especially shortening of physiotherapy. University Hospital Brno is the first in Czechia, conducting endoscopic lumbar herniectomy since 2017. In this article, we present our first experiences.

**Methods:** Between 2017-2020, endoscopic technique was used in 92 patients (20 - 70 years) with disc herniation (L4/5 or L5/S1). We evaluated pain intensity in terms of dorsalgia and radiculopathy using Visual analogue score (VAS), limitations of common activities using Oswestry disability index (ODI). These parameters were evaluated before surgery and furthermore in 6 weeks, 6 months and 2 years after the surgery.

**Results:** There was statistically significant difference in VAS before surgery compared to 6 weeks, as well as 6 months and 2 years outcome with no differences between men and women. There was not significant difference in ODI before the surgery and 6 weeks after surgery in men, while there was a significant difference between ODI before surgery and 6 months and 2 years after surgery. In women the ODI values before surgery were significantly higher compared to 6 weeks, 6 months and 2 years after surgery. Recurrent herniation has occurred in 7 cases, which has been successfully solved by microdiscectomy.

**Conclusions:** All the evaluated parameters were significantly improved or normalized after the surgery, i.e. dorsalgia, radiculopathy, limitations of common activities due pain. Our first experiences with the application of endoscopic technique for lumbar disc herniation surgery are maximally positive and based on these experiences as well as on references from other departments and literature, we plan to use this method in the future.

## Spine

ePoster presentation

Posterolateral thoracotomy oblique approach for dorsal spinal cord extra giant nerve sheath tumours. Safe road, less traversed: report of 3 unusual cases

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**Objectives:** To assess the feasibility of oblique approach in posterolateral thoracotomy for excision of three variants of extra giant nerve sheath tumours extending into posterior mediastinal space and intermuscular-subcutaneous planes.

**Background:** The first case was an elderly male, presented with total paraplegia of 2 months duration. MRI dorsal spine showed very large tumour involving two third of left hemithorax along with intradural tumour. The tumour was excised in single stage via left posterolateral thoracotomy oblique approach and lamino foraminotomy. The second case was a middle-aged man, operated 20 years back for dorsal spine scoliosis with Harrington rod on left side. He presented to the casualty with unusual features of lower abdomen pain. MRI dorsal spine showed large multiloculated tumour in right hemithorax extending from dorsal cord with massive haemorrhage. He underwent right posterolateral thoracotomy oblique approach and excision of tumour with evacuation of hematoma. The third case was 58-year-old man with mid backache and difficulty in walking for 1 month. MRI dorsal spine showed D5—D7 level IDEM with foraminal and extra foraminal extension up to posterior mediastinal space. He underwent right posterolateral thoracotomy oblique approach and gross total excision of tumour with D5-D7 laminectomy and excision of IDEM component.

**Methods:** Modified JOA grading of muscle power in the pre and post operative period was conducted. Post operative MRI was done to document the extent of resection. Regular post operative follow up in neurosurgery opd was done at 1 month interval initially for 3 months and at 2 months interval for 6 months were done and clinical improvement was documented.

**Results:** all the patients improved neurologically

**Conclusions:** Posterolateral thoracotomy with oblique approach provides adequate and safe space for meticulous dissection around posterior mediastinal structures and also for complete tumour excision in extra giant dorsal spinal cord tumours in single stage.

## Hydrocephalus

Oral presentation

Comparison of ETV and VP shunt in management of hydrocephalus associated with Tubercular meningitis - Study of 303 pediatric patients

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**Objectives:** To compare the outcome and to evaluate the factors influencing outcome of Endoscopic third ventriculostomy (ETV) and VP Shunt (VPS) procedures in patients with Tubercular meningitis with hydrocephalus (TBMH).

**Background:** TBMH is most commonly treated with VPS and sometimes with ETV. There remains uncertainty; however, about the comparative superiority of one procedure over the other and there has not been any large randomized study to compare the outcome of these 2 procedures in treatment of TBMH.

**Methods:** Total of 328 pediatric TBMH patients were randomized by a computer generated list of random numbers in ETV (n= 164) and VPS (n= 164) groups over a period of 7 years. The demographic details, clinical status, radio-logical status at presentation and post-op outcome were analyzed for a follow-up period of 6 months. ETV could not be performed in 25 patients due to some logistics problems; therefore 139 patients of ETV group were included for analysis of results as compared to 164 VPS patients. Statistical tests were performed using SPSS ; Univariate analysis of interval data was performed by independent t – test and nominal values by chi-square test. Multivariate analysis was performed by logistic regression analysis.

**Results:** At 6 months the results of ETV group were - Successes 79 (56.83%), needed re-operation – 28 (20.14%), expired – 26 (18.70%), lost to follow up – 6 (4.32%); results of VPS group were - Successes 116 (70.73%), needed re-operation – 19 (11.59%), expired – 25 (15.24%), lost to follow up – 4 (2.44%). However, difference of success between two groups was not significant statistically.

**Conclusions:** Immediate outcome is better and rate of recovery is faster in VPS group as compared to ETV; over a period of 6 months, clinicoradiological recovery in ETV group is comparable with that of VPS. On regression analysis, No significant relation found between different variables and failure/success of ETV .

## Spine

Oral presentation

### The evaluation of smartphone-based applications in the assessment of hand sensorimotor deficits in degenerative cervical myelopathy

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**Objectives:** To determine if phone based applications (PBA) as hand performance test could detect and quantify hand sensorimotor deficits in degenerative cervical myelopathy (DCM) and their relationship with conventional clinical methods namely: 10 second hand grip and release test (10sHGRT), mJOA and cervical cord intramedullary cord hyperintensity (IMCHI).

**Background:** Hand sensorimotor function deficit is a common presentation in DCM. Despite its disabling effect on patient activities of daily living and independence, it is poorly evaluated by clinical examination and current assessment tools. Hand performance test delivered on other electronic devices have shown promise for the objective evaluation of DCM. Studies assessing tests delivered using mobile phones are few.

**Methods:** A prospective age and gender matched, case-control study of DCM (DCM+) and normal (DCM-) participants recruited by a set of inclusion and exclusion criteria. The phone-based application tests (PBATs), mJOA questionnaire and 10sHGRT were done. Cervical spine MRI sagittal view was reviewed for IMCHI.

**Results:** A total of 80 participants were recruited (40 DCM+ and 40 DCM-) with an average age of  $57.98 \pm 2.31$  years. Besides the RTs ( $p=0.67$ ), other tests mean score were significantly different between myelopathic and normal participants ( $p= 0.000$ ).

Spearman rank correlation between mJOA scores and PBATs were significant with correlation coefficients of 0.68, -0.78 and -0.52 for Reflex Test motor (RTm), Reflex Test sensory (RTs) and Maze Runner Test (MRT) score respectively. IMCHI had no significant correlation with the PBATs while area under the curve (AUC) from showed that the RTm (0.885) and MRt (0.815) had good discrimination for DCM while RTs (0.792) had fair discrimination. All PBATs had significant intra rater reliability.

**Conclusions:** PBATs had excellent discrimination for DCM and correlated significantly with conventional assessment methods. The tested PBATs demonstrated clinical utility in DCM evaluation and are good templates for disease specific applications design.

## Paediatric

Oral presentation

### Prevalence of neural tube defects among pregnant women in Addis Ababa: a community-based study using prenatal ultrasound examination

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**Objectives:** The primary aim of this study was to estimate the prevalence of NTDs at ultrasound examination in communities of Addis Ababa and secondarily to provide a description of the dysmorphology of the NTD cases.

**Background:** A global literature review reported NTD prevalence estimates typically ranging from 9 to 22 per 10,000 births, with the lowest in Europe and highest in the Eastern Mediterranean area. Hospital based studies from Ethiopia have reported prevalence estimates of NTDs to be between 32 and 128 per 10,000 births. Still, the ascertainment of cases may have been incomplete in these hospital-based studies as home deliveries are common in countries like Ethiopia.

**Methods:** We enrolled 958 pregnant women from 20 randomly selected health centers in Addis Ababa during the period from October 1, 2018, to April 30, 2019. Of these 958 women, 891 had an ultrasound examination after enrollment, with a special focus on NTDs. We estimated the prevalence of NTDs and compared it with previously reported hospital-based birth prevalence estimates from Addis Ababa.

**Results:** Among 891 women, 13 had twin pregnancies. We identified 15 NTD cases among 904 fetuses, corresponding to an ultrasound-based prevalence of 166 per 10,000 (95% CI: 100–274). There were no NTD cases among the 26 twins. Eleven had spina bifida (122 per 10,000, 95% CI: 67–219). Among the 11 fetuses with spina bifida, three had a cervical and one had a thoracolumbar defect while the anatomical site for 7 was not registered. Seven of the 11 spina bifida defects had skin, while two of the cervical lesions were uncovered.

**Conclusions:** We report a high prevalence of NTDs among pregnancies in communities of Addis Ababa based on screening by ultrasound. The prevalence was higher than in previous hospital-based studies in Addis, and the prevalence of spina bifida was particularly high.

## Spine

Oral presentation

### Cervical laminoplasty: what's new?

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**Objectives:** In this study, we intend to evaluate the impact of radiological parameters on clinical and functional outcomes following cervical laminoplasty using SF-36 which assesses the overall quality of life.

**Background:** Loss of cervical lordosis (LOCL) is an established complication following laminoplasty. Several pre-operative radiological parameters have been described in the literature and found to be useful to identify the patients who are prone to develop LOCL/kyphosis post laminoplasty.

**Methods:** This is an ambispective study. All the adult patients who underwent laminoplasty for CSM/OPLL were included. All the patients underwent standard 2-level to 4-level hinge door laminoplasty under general anesthesia.

**Results:** A total of 110 patients who underwent laminoplasty for CSM or OPLL were included in the study. The mean age was  $57.81 \pm 11.19$  years and the mean duration of symptoms was  $21.39 \pm 15.73$  months. The preoperative CA, C2-C7 SVA, T1S and DER were found to be significantly associated with development of post-operative LOCL on univariate analysis. The ROC curve analysis showed that the AUC values of CA, T1S and DER for predicting LOCL were 0.770 (95%CI 0.681-0.859), 0.705 (95%CI 0.608-0.801) and 0.628 (95% CI 0.517-0.741) respectively.

**Conclusions:** In this study, we have found the radiological outcome, in terms of significant LOCL, to be dependent on preoperative CA, T1S and DER. However, we couldn't find a significant correlation between radiological and functional outcomes. The duration of symptoms prior to surgery in addition to preoperative T1S was found to have a significant impact on both the disease-specific functional outcome as well as the QOL scales.



## Skull Base

Oral presentation

Lateral recess of sphenoid sinus: a hidden site for cerebrospinal fluid leak - an institutional experience

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### Objectives:

- Evaluate the surgical repair technique for CSF Rhinorrhea with defect in Lateral wall of Sphenoid sinus.
- Study of Patient related outcomes in these patients.

**Background:** Cerebrospinal fluid leak from the lateral recess of sphenoid sinus has a prevalence of 7%. When compared to other sites of skull base defects Lateral recess is extremely rare. Endoscopic repair of CSF leak has superseded transcranial repair in most cases. In these cases, an extended approach with transpterygoid route is a prominent surgical technique for repair. It is to be noted that many of these patients can have a component of increased ICP which can be responsible for failure and recurrence.

**Methods:** Patients who underwent endoscopic CSF rhinorrhea repair from 2015-2023 We analyzed the patient characteristics, the site of leak, technique of repair, outcomes and also the presence of increased ICP in these patients.

**Results:** 12 patients out of 76 rhinorrhea had defects in lateral recess. All patients underwent transpterygoid approach and repair. Total of 14 repairs were performed in 12 patients i.e., two patients had bilateral defects. 8/12 - Female and 4/12- Male. 7/12 patients had BMI >25 (overweight) which had a p value of <0.05. 5/11(papilledema) and 2/11 (optic atrophy). 5 patients had concurrent lesions in form of Vestibular schwannoma, trigeminal schwannoma, Idiopathic intracranial hypertension, Dural AV Fistula and Arteriovenous malformation. 5 of the 12 patients warranted CSF diversion post CSF leak repair who demonstrated increased ICP.

**Conclusions:** CSF Rhinorrhea due to defect in lateral wall of sphenoid sinus is a rare entity and the endoscopic transpterygoid approach for repair is an excellent option. As seen in our series it seems that component of increased ICP is frequently associated with these cases and may warrant a CSF diversion post CSF leak repair.

## Education, Ethics, Socioeconomic

Oral presentation

The contribution of qualitative research to neurosurgery and the patients and families affected by neurosurgical conditions: a scoping review

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**Objectives:** To determine what qualitative studies have investigated neurosurgical conditions and treatments from the perspective of neurosurgeons, patients and families.

To establish the extent, range, and nature of research activity, and the value of undertaking a full systematic review.

**Background:** Qualitative methods play a critical role in understanding healthcare and improving practice. Despite this, qualitative research is underused in medicine and even more so in surgery. While there have been reviews of qualitative research in general and rural surgery, there has been no such quantification of qualitative methods in neurosurgery.

**Methods:** A search protocol combined terms relating to Population (Neurosurgeons, patients, carers, trainees), Context (Neurosurgical treatments and/or conditions) and Concept (Qualitative research). The search was deployed in: Medline via Embase; OVID via Embase; PsycINFO via Ebsco; Scopus; Web of Science Core Collection; and Global Health via Ebsco. The validity of the search was confirmed by checking the results against a core set of 12 papers.

**Results:** Over 15,000 studies were screened by title and abstract and 924 by full text. Data were extracted for 626 studies. The studies showed the use of a wide variety of qualitative methods; however, many lack methodology, theory and reflexivity. A lack of reporting standards, studies and authors from low- and middle-income countries and neurosurgeons as first authors was also identified.

**Conclusions:** This review demonstrates the valuable contribution that qualitative studies make to the neurosurgical evidence base. However, there are significant gaps in how these are adopted between the different neurosurgical specialities. We would recommend systematic reviews and qualitative evidence syntheses of specific sub-sets of the literature to both interrogate the methods used in the studies and advance understanding of the contribution these studies make to clinical care.

## Oncology

ePoster presentation

Endoscopic biopsy of lateral and third ventricular tumours: experience of a single neurosurgical unit

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**Objectives:** To study the

i) diagnostic rate

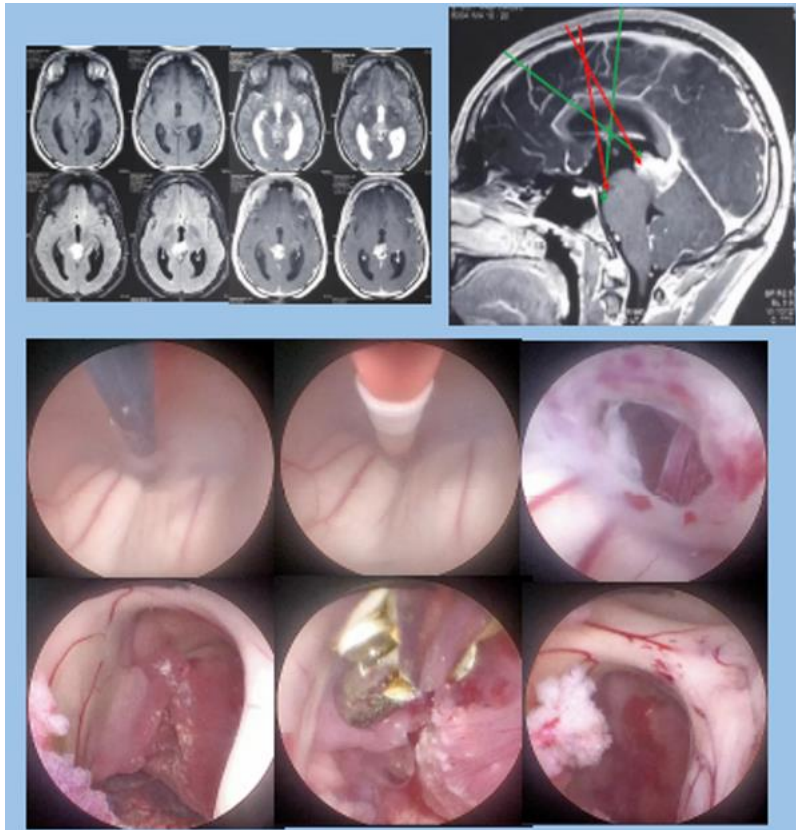
ii) diagnostic accuracy, and

iii) safety of neuroendoscopic biopsy,

in patients with lateral and third ventricular tumours.

**Background:** Tumours of the ventricular system account for less than 1% of intracranial lesions. Neuroendoscopic biopsy is sometimes the only necessary surgical step in the management of these lesions, more often so in tumours of the pineal region. Neuroendoscopic biopsy also allows for concomitant CSF diversion, when necessary; besides obtaining tissue for a histopathological diagnosis.

**Methods:** This is a retrospective study of neuroendoscopic biopsy procedures in patients with lateral and third ventricular tumours from 2003 to 2022 at a single neurosurgical unit in a tertiary care hospital. Demographic data, clinical presentation, operative notes, complications, histopathology, and follow-up data were all retrospectively reviewed and descriptively analysed.



**Results:** There were 58 patients in the study period, who underwent endoscopic biopsy for intraventricular tumours in the lateral or third ventricle. The male: female ratio was about 2:1. The median age at presentation was 17 years. Features of raised intracranial pressure (81%) were the commonest mode of presentation. The endoscopic biopsy diagnosis rate was 96.55% and the accuracy rate (in patients who subsequently underwent a microsurgical or endoscopic resection) was 82.35%. Concomitant ETV was performed in 43 patients and a septostomy in 6. The ETV success rate was 88.4%. The overall complication rate of endoscopic biopsy was 12.1%. No mortality occurred due to endoscopic procedures.

**Conclusions:** Neuroendoscopic biopsy of intraventricular tumours is a safe and effective procedure, with good diagnostic and accuracy rates, and allows for successful concurrent CSF diversion, when necessary; thereby helping avoid major surgeries and shunt implantation.

## Neurovascular Surgery

ePoster presentation

Hydrocephalus due to foramen monroe obstruction by a basilar trunk aneurysm: spontaneous thrombosis after shunting

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**Objectives:** Giant basilar trunk aneurysms are rare and present with obstructive hydrocephalus.

These problematic aneurysms may spontaneously and paradoxically thrombose after shunting due to decreased intracranial pressure and changes in the arterial flow dynamics.

**Background:** Giant basilar artery aneurysms are less than 1% of all intracranial aneurysms, and the growth of these aneurysms into the third ventricle causing hydrocephalus is extremely rare. Hence, the diagnosis is usually made after the onset of the symptoms. However, the first-line treatment is still controversial. Whether to intervene in the hydrocephalus or aneurysm first is still debatable, and there is no consensus. We present a case of a giant basilar trunk aneurysm that spontaneously thrombosed after inserting a ventriculoperitoneal shunt.

**Methods:** A 66-year-old female patient with a known giant basilar trunk aneurysm was referred from the emergency department due to gait abnormalities, headache, and confusion. The patient was awake but confused and apathetic, with 4/5 quadriparesis and right-sided facial asymmetry. CT scan revealed hydrocephalus without SAH, a basilar artery aneurysm extending to the third ventricle. After discussing with interventional radiology, ventriculoperitoneal shunting was decided as the first-line treatment.

**Results:** A right-sided placement of ventriculoperitoneal shunting was performed using ultrasound guidance with no catastrophic complication. The patient was discharged after three days once her quadriparesis and cognition improved. After a month of follow-up, the patient was readmitted for embolization, but the CT angiogram revealed that the giant basilar trunk aneurysm was spontaneously thrombosed; the patient was discharged without intervention.

**Conclusions:** Giant basilar trunk aneurysms may cause obstructive hydrocephalus. Its treatment remains challenging; io-USG and other intraoperative guidance techniques are necessary to ensure a safe treatment. In addition, these aneurysms may spontaneously and paradoxically thrombose after shunting due to decreased intra-cranial pressure and change in the arterial flow dynamics. Large case series may facilitate to conclude a certain treatment algorithm.

## Skull Base

ePoster presentation

### Double pituitary adenomas in patients with Cushing's disease

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**Objectives:** In this study, we analyzed our experience with the diagnosis and treatment of double PAs in patients with CD.

**Background:** In this study, we analyzed our experience with the detection and treatment of double PAs in patients with CD.

**Methods:** Overall, 125 patients operated on in our department by one neurosurgeon from 2009 to 2022 with CD were included in the study: 51 before 2017 and 74 after 2017. In the pre-2017 group of patients, three (5,9%) out of 51 had double adenomas, and all of them were seen on MRI images. All patients underwent transsphenoidal surgery (TSS) with endoscopic and neuronavigation assistance. Before 2017, we completely relied on MRI findings while planning surgery. From 2017 onwards, a broad revision of the sella turcica was conducted during surgeries regardless of the MRI data.

**Results:** We encountered 7 more out of 74 (9,4%) double PAs during the next period. Only 4 of them had been revealed by MRI. The remission rate was higher after 2017 and amounted to 66 out of 74 (89%). In contrast, before the implementation of total revision (pre-2017), our success rate was 82% (42 out of 51 cases). Both neoplasms in cases of double PAs yielded similar histological and immunohistochemical (IHC) features but were consistent with multiple PAs.

**Conclusions:** Although the improvement in our results in recent years can not be clearly attributed to a targeted search for the second microadenoma, we still recommend performing a broad inspection of the sella turcica after the excision of the pituitary microadenoma regardless of preoperative MRI data.

## Global Neurosurgery

ePoster presentation

### Neurosurgery in Cote d'Ivoire: past, present and future

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**Objectives:** Narrate the development of Neurosurgery in Cote d'Ivoire

**Background:** The earliest documented instance of modern neurosurgical care in Cote d'Ivoire dates back to 1974 with Dr. Cornil. Since then, the field has experienced significant growth and development. The neurosurgical workforce has expanded from a single individual to 29 practicing neurosurgeons, and general neurosurgical care has diversified to include subspecialties such as minimally invasive spine surgery, neuro-endoscopy, interventional neuro-radiology, and neuro-oncology.

**Methods:** This study presents a comprehensive account of the evolution of neurosurgical care and training in Cote d'Ivoire. It also highlights the current innovations and structural improvements aimed at expanding the neurosurgical workforce not only within the country but also in the wider West African region.

**Results:** The authors specifically discuss the contributions of key pioneers, the expansion of surgical skills, and the establishment of a lasting structural legacy in the field of neurosurgery.

**Conclusions:** Over the span of five decades, neurosurgery in Cote d'Ivoire has made significant advancements in terms of local training and the provision of a wide range of neurosurgical services. However, a persistent challenge remains the dissemination of neurosurgical care across different regions within the country, emphasizing the need for improved geographical accessibility of these services.

## Functional

ePoster presentation

Special interdisciplinary and surgical strategies for optimal outcome and low morbidity in a series of 500 deep brain stimulation procedures

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**Objectives:** To outline a standardized protocol on interdisciplinary cooperation and on refined surgical measures in Deep Brain Stimulation (DBS) in an attempt to minimize surgical and functional sequelae.

**Background:** Despite all reported advantages of DBS in advanced movement disorders, patients and colleagues are concerned by surgical risks such as hemorrhage, infection or stimulation induced dysfunction.

**Methods:** From October 2010 to February 2023, in a prospectively collected series of 500 DBS procedures (330 for Parkinson's disease, 105 for dystonia, 50 for essential tremor, 15 for rare indications) a standardized interdisciplinary protocol was carried out on patient evaluation, selection and intra- and peri-operative care and special techniques in trajectory and target planning, lead placement and fixation. Instead of industrial caps, autologous bone and titanium mini plates for lead fixation were used. In regular interdisciplinary case conferences, all patients were carefully evaluated for their post-surgical images, lead positions and response to DBS at a minimum follow-up of 3 months.

**Results:** In 500 consecutive interventions, 980 leads were implanted, after a mean of 2 micro-electrodes per hemisphere for micro-recording and semi-macro-test stimulation. Early complications were one intra-operative epidural hematoma and delayed postsurgical intra-cerebral hemorrhage in 3 patients (0.6%), and 3 infections (0.6%). An idiopathic delayed onset edema was documented in 2.9% but has increased to 6.9% in the last 2 years and was treated by short term corticosteroids in symptomatic patients, with complete resolution in all of them. In 16 patients, the indication for surgical revision of lead positions was set and performed successfully.

**Conclusions:** The presented interdisciplinary and surgical protocols provide very good functional outcome and reduced morbidity rates in DBS. On-going transparency is the best preventive measure with regards to any type of treatment risks.



## Skull Base

Oral presentation

Brain retractor can be safely and effectively used by opening the horizontal fissure for resection of cerebellar pontine angle tumors

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**Objectives:** To evaluate the safety of using a brain retractor with horizontal fissure dissection in a lateral suboccipital approach (LSA) for cerebellopontine angle meningiomas and schwannomas.

**Background:** The LSA is most commonly used to resect schwannomas and meningiomas arising in the cerebellopontine angle. One of the disadvantages of this approach is reportedly brain damage due to cerebellar retraction.

**Methods:** We retrospectively reviewed 107 cases of cerebellopontine angle schwannomas and meningiomas resected by LSA at our hospital between 2011 and May 2023. In all cases, we routinely used surgical strategy comprising an opening horizontal fissure and a retractor usage. We retrospectively reviewed the complications such as cerebral contusion and infarction in the brain stem or the middle cerebellar peduncle.

**Results:** GTR and NTR were achieved in 49.0% and 28.7% of all 107 cases (85 schwannomas and 23 meningiomas), respectively. Cerebellar contusion was observed in 3 patients (2.8%), brainstem infarction in 4 patients (3.7%), and middle cerebellar leg infarction in 13 patients (12.0%). The long-term prognosis of the middle cerebellar peduncle infarction was favorable, with complete recovery in 85% of the patients.

**Conclusions:** The key to safe tumor resection is using a brain retractor to create the V-shaped space by opening the horizontal fissure. This technique protects the cerebellar hemispheres, middle cerebellar peduncle, and petrosal vein while allowing the suction tube to move freely. Without a brain retractor, the free movement of the suction tube or forceps is deprived by their midsections compressing the cerebellum, reducing maneuverability in the deep operative field. Cerebellar contusions can be safely avoided with this technique, but what cannot be avoided is infarction of the middle cerebellar peduncle; however, since it recovers well, aggressive resection can be conducted near the middle cerebellar peduncle. We also discuss the details of how to use the retractor safely.

## Education, Ethics, Socioeconomic

ePoster presentation

Establishing the first neurosurgical skill laboratory in West Africa: an initiative for an affordable regional education center

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<sup>1</sup>*Felix Houphouet Boigny, Neurosurgery, Cote D'Ivoire*

**Objectives:** To present a dedicated neurosurgical laboratory in West Africa

**Background:** The benefits of a neurosurgical skill laboratory (NSL) are unquestionable. Despite the increasing number of sub-Saharan African neurosurgeons, few cadaveric laboratories are available for neurosurgical education. The first of its kind in West Africa, a NSL opened in 2019 in Abidjan, Cote d'Ivoire to promote neurosurgeons' education and technical skills. We have described our experience in creating and running this facility.

**Methods:** NSL is a private academic center in Abidjan, Cote d'Ivoire. It includes 2 rooms dedicated to cadaveric hands-on training and microscopic neurosurgery and multipurpose rooms, which contain 7 table-mounted microscopes and 3 endoscopes. The designed layout replicates an operating room. The curriculum was designed to meet the needs for training for complex brain and spine surgeries.

**Results:** The training covers skull base (conventional and extended) approaches, microsuturing, and anterolateral and posterior approaches for spine surgeries. The training was open to residents and consultants. The faculty members included anatomists, neurosurgeons, otolaryngologists, and orthopedists. Additionally, the NSL welcomes fellows from foreign countries. Fellows from 4 countries have been trained, and 17 educational activities have been organized.

**Conclusions:** In the present report, we have provided insight into a sub-Saharan African neurosurgical laboratory striving toward an affordable and self-sustainable center. The short-term goal of the NSL is to be a center for developing technical skills for African neurosurgeons for better patient outcomes.

## Global Neurosurgery

Oral presentation

Awake craniotomy – a single centre experience in a tertiary care hospital

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**Objectives:** With recent advances in neuro-monitoring methods the indications for Awake Craniotomy in our neurosurgical practise has reduced. Awake craniotomy is a much-needed option in our management for the tumours in eloquent areas in our setup.

**Background:** This study helps us to know about this techniques and its usefulness in our setup.

**Methods:** This study was conducted in Institute of Neurosurgery, Rajiv Gandhi Government General Hospital and Madras Medical College, Chennai. It was a prospective descriptive study of 23 consecutive patients who underwent awake craniotomy for lesions within the eloquent cortex. Only patients who did not have altered sensorium, speech disturbances or motor deficit were included.

**Results:** The patients, who underwent awake craniotomy for lesions in eloquent cortex by this method, had a favourable outcome with respect to morbidity profile and fixed neurological deficits than conventional craniotomy. This method was more cost effective and was easier to perform without much technical glitch.

**Conclusions:** Awake craniotomy is a safe and effective method of achieving an optimal volume reduction of lesions located in and around the eloquent cortex with a low degree of postoperative neurological deficit.

## Global Neurosurgery

ePoster presentation

Unveiling the potential application of intraoperative brain smear for brain tumor diagnosis in low-middle income countries: a comprehensive systematic review

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**Objectives:** The review aims to evaluate the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of intraoperative brain smear as a diagnostic tool in LMICs.

**Background:** Immediate intraoperative histopathological examination of tumor tissue is indispensable for a neurosurgeon to track surgical resection. A brain smear is a simple, rapid, and cost-effective technique, particularly advantageous in the treatment of brain tumors due to their soft nature. To determine the usefulness of intraoperative brain smear in the diagnosis of brain tumors in low- and middle-income countries (LMICs).

**Methods:** A comprehensive search of the literature was conducted using PubMed, Scopus, and Google Scholar. The retrieved articles were independently screened by 2 reviewers. The data was extracted, processed, and organized using Microsoft Excel.

**Results:** A total of 59 out of 553 articles screened were included in the final analysis. The sensitivity and specificity of the intraoperative smear of brain tumors was found to be over 90% in most studies. The positive and negative predictive values were also high, and the overall accuracy was found to be greater than 80% in most studies. One recurrent theme in the majority of the included studies was that intraoperative brain smear is a cost-effective, quick, accessible, and accurate method of diagnosing brain tumors, requiring minimal training and infrastructure.

**Conclusions:** Intraoperative brain smear is a simple, rapid, cost-effective, and highly sensitive diagnostic modality for brain tumors. It can be a viable and accessible alternative to more traditional methods such as frozen sections and can be incorporated into neurosurgical practice in LMICs as a reliable and efficient diagnostic tool.

## Spine

Oral presentation

### Improving the translation of stem cell therapy for spinal cord injury

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**Objectives:** To improve the translation of stem cell therapy for spinal cord injury from animals to humans, we sought to identify intrinsic differences between primary human spinal cord stem cells and endogenous neural stem/progenitor cells (NSPCs) from animal models, and genetically reprogrammed NSPCs (grNSPCs).

**Background:** While strategies for treating spinal cord injury with endogenous NSPCs or grNSPCs have been developed, successful translation of these therapies have not occurred. To improve the translation of NSPC targeted treatments for spinal cord injury requires an understanding of the intrinsic differences of the therapeutic NSPCs and primary human NSPCs.

**Methods:** We characterized NSPCs from the adult human spinal cord of organ donors and compared them to NSPCs from animal models for spinal cord injury (pigs and rats) and grNSPCs that were generated from the same human organ donor.

**Results:** We found that human NSPCs are neurogenic, even in the presence of inflammatory cues, while animal NSPCs are gliogenic. It was also discovered that the regulation of human NSPC fate by exogenous molecules required a different set of conditions than rat NSPCs. An RNA analysis of human, pig, and rat NSPCs depicts differences in transcription factors regulating fate decision making processes. Finally, a direct comparison of human spinal cord NSPCs and grNSPCs of the same organ donor revealed a similar differentiation profile of high neurogenic potential, but differences in their genetic makeup with respect to their regional identity and neural stem cell markers.

**Conclusions:** Our study suggests that the effectiveness of regenerative treatments in humans could be influenced by the functional and molecular differences between human and animal spinal cord NSPCs and which could be optimized using our assay. Our study also suggests that the latest methods of generating spinal cord-specific grNSPCs produce grNSPCs that bear some functional resemblance to bona fide NSPCs, but still exhibit differences in gene expression.

## Oncology

ePoster presentation

Surgical resection of posterior fossa hemangioblastomas. 5 years experience at Edgardo Rebagliati Martins National Hospital – Peru

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**Objectives:** - Describe the characteristics of hemangioblastomas operated in our institution.

- infer the postoperative results based on patient characteristics, type of hemangioblastoma or surgery characteristics.

**Background:** Hemangioblastomas are rare lesions of the central nervous system, corresponding to 7-8% of posterior fossa lesions. These lesions are considered benign (WHO grade I). The importance of this lesion lies in its potential healing with complete surgical resection, which must be extremely careful given the hypervascularity of the lesion.

**Methods:** All the cases from our hospital were included in this study. Epidemiological and clinical characteristics, treatment, results one year after surgery, were retrospectively reviewed. We try to find characteristics that favor better results.

**Results:** Of the total, 10 were female and 6 were male with a mean age of 48.81 (SD: 15.37 [22 – 79]) years. Of the 4 types of hemangioblastomas distinguished in the literature, the type 1 (nodular) being the most frequent type with 10 (62.5%) cases. The debut clinical picture of 5 (31.5%) of the patients was intracranial hypertension due to hydrocephalus, 10 (62.5%) patients were admitted due to cerebellar syndrome and 1 (6.25%), patient was admitted due to left hemiparesis. Total resection was evidenced in 13/16 (81.3%) patients, while 3/16 (18.75%) patients had a partial resection. 12/16 (75%) patients presented a volume of intraoperative bleeding <1500cc, and 3/16 (18.75%) patients presented a volume >1500cc. Regarding outcome, 10/16 (62.5%) had a favorable result at one year

(according to the ECOG scale), and 6/16 (37.5%) had an unfavorable result.

Tabla 1. EPIDEMIOLOGICS CHARACTERISTICS

	S	E	TIPO	TAMAÑO (AP, ALT, ANCHO)	LOCALIZACIÓN	VOL SANGRADO	RESECCIÓN	OUTCOME (ECOG) AL AÑO
1	M	51	PARENQUIMATOSO (TIPO 2)	3.7 X 3 X 4.1	RIGHT CEREBELLUM HEMISPHERE	13500CC	PARCIAL	5
2	F	79	PARENQUIMATOSO (TIPO 2)	2.3 X 2.3 X 2.5	LEFT CEREBELLUM HEMISPHERE	14000CC	PARCIAL	5
3	F	47	SÓLIDO CON QUISTES INTERNOS (TIPO 4)	2.8 X 2.4 X 4	RIGHT CEREBELLUM HEMISPHERE	300CC	TOTAL	0
4	F	49	PARENQUIMATOSO (TIPO 2)	2.8 X 2.6 X 2.3	LEFT CEREBELLUM HEMISPHERE	300CC	TOTAL	3
5	F	43	NODULAR (TIPO 1)  NODULAR (TIPO 1)	1.2 X 1.2 X 1.7  0.3 X 0.5 X 0.7	RIGHTE + LEFT CEREBELLUM HEMISPHERE	DESC	TOTAL	3
6	F	62	NODULAR (TIPO 1)	2.8 X 2.8 X 3.2	RIGHT CEREBELLUM HEMISPHERE	500CC	TOTAL	1
7	M	51	NODULAR (TIPO 1)	1.5 X 1.6 X 2.2	LEFT CEREBELLUM HEMISPHERE	400CC	TOTAL	0
8	F	31	NODULAR (TIPO 1)	2.8 X 5.2 X 2.7	BULBO-MEDULAR	700CC	TOTAL	5
9	F	22	NODULAR (TIPO 1)	3.3 X 3.1 X 4.4	RIGHT CEREBELLUM HEMISPHERE	500CC	TOTAL	1
10	M	50	NODULAR (TIPO 1)	4.3 X 2.8 X 4.4	RIGHT CEREBELLUM HEMISPHERE	500CC	TOTAL	2
11	M	68	PARENQUIMATOSO (TIPO 2)	4.1 X 3.2 X 4	LEFT CEREBELLUM HEMISPHERE	14000CC	TOTAL	4
12	M	59	NODULAR (TIPO 1)	1.8 X 2.2 X 1.6	LEFT CEREBELLUM HEMISPHERE	500CC	TOTAL	0
13	F	32	SÓLIDO CON QUISTES INTERNOS (TIPO 4)	2.4 X 2.2 X 2	RIGHT CEREBELLUM HEMISPHERE	700CC	TOTAL	0
14	F	32	NODULAR (TIPO 1)	3.8 X 2.9 X 4.2	RIGHT CEREBELLUM HEMISPHERE	500CC	TOTAL	1
15	F	65	NODULAR (TIPO 1)	3.5 X 2.6 X 3.4	LEFT CEREBELLUM HEMISPHERE	400C	TOTAL	0
16	M	40	NODULAR (TIPO 1)	4.2 X 3.8 X 4.2	RIGHT CEREBELLUM HEMISPHERE	300CC	TOTAL	0

**Conclusions:** Hemangioblastomas are rare lesions. Our 5-year results have shown an epidemiological relationship with respect to the literature, evidencing better results in patients with nodular-type lesions, with surgical bleeding <1500cc and with total surgical resection.

## Skull Base

ePoster presentation

Early experience of endoscopic endonasal transphenoidal surgery for pituitary adenoma: in a West African institution (report on 65 cases)

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**Objectives:** This study was designed to assess the early results of endoscopic endonasal approach (EEA) for pituitary adenoma from an under-equipped environment.

**Background:** Although endoscopic endonasal approach (EEA) has been popularized worldwide for pituitary adenoma surgery, in sub-Saharan Africa, neurosurgeons are still only starting their experience with it.

**Methods:** The data of 56 cases of EEA for pituitary adenoma surgery performed between 2016 and March 2019 at the Teaching Hospital of Yopougon-Abidjan and Bouaké were retrospectively assessed. Pre- and postoperative neuro-ophthalmologic and hormonal status were analyzed. Moreover, the quality of tumor removal, and pre- and postoperative complications were also evaluated.

**Results:** In this study, there were nonfunctional adenomas (20), prolactinoma (18), Cushing disease (9), and acromegaly (3). A reduced visual acuity and/or visual field defect was observed in 49 cases. The mean operation time was 225.94.7 minutes. The tumor removals were complete in 57.14%, subtotal in 35.71%, and partial in 7.14%. These led to a visual improvement in 69.64%. Postoperative complications were cerebrospinal fluid leaks (19.64%), diabetes insipidus (12.50%), visual worsening (7.14%), meningitis (3.57%), and carotid injury (3.57%) that led to death.

**Conclusions:** This study represents the early surgical experience using EEA for treating pituitary adenoma in an under-equipped environment. Although the postoperative complication rate was relatively high, refinements of local surgeons' technique would lead to a better patient outcome.



## Oncology

Oral presentation

Tran-temporal trans-choroidal approach for thalamopeduncular lesions: a pragmatic approach

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**Objectives:** In this paper we are describing our experience and approach to seven patients with thalamopeduncular tumors, using a transtemporal trans choroidal fissure approach.

**Background:** In this paper we are describing our experience and approach to seven patients with thalamopeduncular tumors, using a transtemporal trans choroidal fissure approach.

**Methods:** The procedure is described for seven surgically treated patients with unilateral thalamopeduncular lesions the important landmarks of this approach i.e., choroidal fissure, inferior choroidal point and cerebral peduncle relations were defined. Intraoperative neuro monitoring and ultrasound were used for resection of tumor without deficits. technical aspects and pitfalls of the procedure are discussed.

**Results:** Mean age at presentation was 6 years (range 5-16 years). The predominant symptom was weakness of contralateral limbs (78%) followed by raised ICP features (22%). The management protocol included magnetic resonance imaging and tractography. As the tumor displaced cortico spinal tracts medially, temporal horn laterally and occupied ambient cistern, temporal trans choroidal fissure approach was executed. Immediate postoperative contrast enhanced CT and at three months follow up MRI was done to assess the extent of resection. Tumor resection was near total in 6 patients(86%).The histopathology of lesions was pilocytic astrocytoma in 4 patients (58%), diffuse astrocytoma in 2 patients(28%) and glioblastoma in 1 patient(14%).Mean follow up was 28 months (6-50 months). No mortality or additional morbidity were noted.

**Conclusions:** In the vast repertoire of approaches to thalamopeduncular tumors, temporal trans choroidal approach allows greater surgical angle for radical resection without undue retraction and deficits. Intraoperative neuro monitoring and USG are indispensable adjuncts in resection without deficits.

## Global Neurosurgery

Oral presentation

Geospatial analysis of the availability, distribution and accessibility of neurosurgical facilities, workforce and infrastructure in Nigeria; and projection towards 2050

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**Objectives:** The study's objectives are:

- (1) to quantitatively assess the availability and distribution of neurosurgical resources in Nigeria;
- (2) to project the neurosurgical workforce capacity up to 2050; and
- (3) to determine the population with timely access to neurosurgical care.

**Background:** Modern neurosurgery began in Nigeria in 1962, when Latunde Odeku established a unit at the University College Hospital, Ibadan. Since then, there has been a progressive increase in neurosurgical capacity.

**Methods:** A 5-section, 83-question, online survey of Nigerian neurosurgeons and residents assessed the neurosurgical infrastructure, workforce, and resources. The results were analyzed descriptively, and geospatial analysis using Arc-GIS tools was used to map the distribution and timely access to neurosurgical care. A projection model was fitted to predict workforce targets for 2022-2050.

**Results:** 149 respondents completed the survey: 141 males; mean age 41.8 ( $\pm$  6.9) years; 82 fully trained neurosurgeons. Out of 86 neurosurgery-capable health facilities, 65.1% were public hospitals, with only 17.4% accredited for residency training. Dedicated hospital beds and operating rooms for neurosurgery make up only 4.0% and 15.4% of the total, respectively. The population disease burden is estimated at 50.2 per 100,000, while the operative coverage was 153.2 cases per neurosurgeon. There are currently 132 neurosurgeons and 114 neurosurgery residents for a population of 218 million (ratio 1:1.65 million), with skewed distribution favoring the Southern and Central regions. There is an annual growth rate of 8.3%, resulting in a projected deficit of 1113 neurosurgeons by 2030 and 1104 by 2050. An annual scale-up of 33.9% and 10.7% is required to meet the 2030 and 2050 population workforce targets, respectively. Timely access to neurosurgical care ranges from 21.6% to 86.7% of the population within different timeframes.

**Conclusions:** Collaborative interventions are needed to address gaps in Nigeria's neurosurgical capacity. Investments in training, infrastructure, and funding are necessary for sustainable development and optimized outcomes.

## Neurovascular Surgery

Oral presentation

The Stroke Thrombectomy and Aneurysm Registry (STAR) - an international consortium for advancing management of cerebrovascular disease

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On behalf of the STAR collaborators<sup>3</sup>

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**Objectives:** To develop an international data and tissue registry to evaluate and optimize outcomes of cerebrovascular disease in the real-world

**Background:** The field of endovascular management of cerebrovascular disease including stroke and brain aneurysms have been rapidly developing requiring ongoing re-assessment of indications for intervention, target disease population, technical and clinical outcomes. Therefore, there is an imminent need for developing a comprehensive international data management that can maintain rigorous evaluation of clinical and technical outcomes.

**Methods:** STAR is a multicenter and international platform to curate patient outcome data after cerebrovascular intervention for stroke, aneurysms and other cerebrovascular diseases. STAR includes all patients who underwent neurosurgical or neurointerventional procedures for acute ischemic stroke or brain vascular malformations. Patients were curated starting 01/2015 and are prospectively enrolled by each site. Patient charts are reviewed for clinical, radiographic and outcome data, and procedure notes are reviewed for technical outcomes. A central statistical and data management core coordinates with participating sites and their regulatory services to ensure data accuracy, consistent reporting, and perform required analyses.

**Results:** Since its inception, a total of 205 sites have completed initial requirements for STAR, of which 81 sites completed all regulatory and administrative requirements, and 52 sites have actively contributed data to STAR. A total of 10229 stroke and 4328 aneurysm patients are enrolled. Studies from the STAR registry provided early evidence for efficacy of endovascular thrombectomy in posterior circulation, distal occlusions and large core infarcts which was eventually demonstrated in randomized controlled trials. The STAR team implemented a clinical collaborative infrastructure for communication between investigators pertinent to daily patient management, intra-operative consults, live-streaming of cases for fellows at different institutions, and personal visits for sharing expertise.

**Conclusions:** The STAR registry provides an infrastructure conducive for robust real-world data analytics to progress clinical care in neurointervention and foster international collaborations.

## Trauma

Oral presentation

### Presumptive antioxidant therapy in traumatic brain injury: a single-centre randomized controlled trial of ascorbic acid and alpha-tocopherol

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**Objectives:** A single-center evaluation of outcomes following Ascorbic Acid (AA) and  $\alpha$ -Tocopherol mono or combination therapy in patients with moderate and severe traumatic brain injuries (TBI).

**Background:** Reactive oxygen species (ROS) have been validated as key players in the pathophysiology of acute brain injury with increased generation early in the post-traumatic period. Endogenous antioxidants, including albumin and uric acid, are often overwhelmed, leading to increased vulnerability to oxidative brain injury.

AA inactivates free radicals in water-soluble compartments and helps regenerate oxidized vitamin E.  $\alpha$ -Tocopherol (Vitamin E) is lipid-soluble and functions to protect polyunsaturated fatty acids and cell membranes from oxidative damage.

We evaluated outcomes following AA and  $\alpha$ -Tocopherol administration to patients with TBI.

**Methods:** This was a prospective randomized study of patients presenting to within 24-hours of moderate or severe TBIs over a 21-month period.

Randomization was into one of four therapeutic groups administered either AA,  $\alpha$ -Tocopherol, combination of AA and  $\alpha$ -Tocopherol or placebo therapy for five consecutive days.

Serial serum assays for uric acid and albumin were conducted. The 14-day mortality, Glasgow Outcome and Disability Rating Scores at day-14 and 6-weeks were assessed.

**Results:** 308 patients were randomized into 4 groups of 77 each. There was a steady decline in serum albumin and uric acid levels over the duration of therapy.

The placebo group had the highest percentage mortality (21.6%). There was no statistically significant difference in day-14 mortality between the study groups ( $P = 0.991$ ).

Patients administered  $\alpha$ -Tocopherol monotherapy or in combination with AA were more likely to attain 'Good Recovery' at day-14 ( $P < 0.05$ ). AA monotherapy led to higher Disability Rating Scores.

**Conclusions:** Presumptive administration of AA and  $\alpha$ -Tocopherol as mono or combination therapy did not lead to significant difference in day-14 mortality.  $\alpha$ -Tocopherol-based therapy led to earlier attainment of 'Good Recovery' status.

## Oncology

Oral presentation

Microsurgical resection of glioblastoma causes ischemic microenvironment around the resected area and proneural-to-mesenchymal transition on tumor cells

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**Objectives:** The objective of this study was to evaluate the impact of microsurgical resection of glioblastoma (GB) on the plasticity of unresected GB cells, as well as on the tumor microenvironment (TME) by performing morphological and transcriptomic phenotyping.

**Background:** GB is the most common and lethal primary brain tumor. Four GB cellular states drive intratumor heterogeneity of malignant cells influenced by genetics and TME. Despite optimal treatment (maximal safe surgical resection, fractionated radiotherapy and systemic chemotherapy with temozolomide), recurrence is higher than 90%. Recurrence begins around the resection area, where regrowth of cells that were not removed become therapy resistant due to possible TME-influenced changes in their phenotype.

**Methods:** C57Bl6j mice and syngeneic GB IDH-wildtype cell lines CT2A and GL261 were used. GFP-transduced GB cells were orthotopically implanted. We developed a refined microsurgical resection protocol for GB in size-matched mice and carefully followed the same surgical steps performed in patients. The mice were randomly divided into four groups: control (prior to surgery) and 1, 3, and 7 days post-surgery. Tumor tissues were harvested for immunohistochemistry (IHC), bulk and single-cell RNA sequencing.

**Results:** Time-resolved transcriptomic and IHC analyses showed that surgical damage induced pronounced proneural-to-mesenchymal transition (PMT), stimulation of hypoxia-driven pathways, and induction of chromatin remodeling in residual post-surgery GB cells, independent of the transcriptional landscape of GB cell lines. Moreover, single-cell RNA-seq of post-resection tumors allowed us to observe significant changes in the TME that are in line with exposure to ischemia, specifically in microglia, T-cells and Tregs.

**Conclusions:** The early postoperative phenotypic landscape in glioblastoma is characterized by a transient ischemic TME that induces PMT in GB cells. Targeting these regulatory processes could be the objective for new intra-operative adjuvant treatments. Additionally, we've established a well-characterized and refined microsurgical resection model that may serve to evaluate therapeutic agents under reproducible and controlled conditions.

## Trauma

Oral presentation

Management of neurotrauma in limited human and economic resources conditions

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**Objectives:** Management of Neurotrauma in limited human and Economic Resources conditions; Albania experience.

**Background:** Craniocerebral traumas are one of the major causes of death and disability from trauma in general. Despite major medical developments, the management of craniocerebral trauma remains in most cases in the hands of neurosurgeons.

**Methods:** We bring the experience of neurotrauma management to Albania. The management of neurotraumas is presented as an adaptation of two situations. The economic situation of Albania and the lack of specialist neurosurgeons.

**Results:** The management of neurotraumas is presented as an adaptation of two situations. The economic situation of Albania and the lack of specialist neurosurgeons.

**Conclusions:** Due to the economic situation, we are forced to adapt the neurotrauma treatment protocols with the tools we have available. We analyze the methods of diagnosis, monitoring and treatment of neurotraumas. Likewise, in Albania there is a lack of neurosurgeons in regional hospitals. To fill this gap, communication tools such as telemedicine and training of doctors in regional hospitals with knowledge on neurotraumas have been used.

## Global Neurosurgery

ePoster presentation

### Management of sigmoid and transverse sinus injury: a case report

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**Objectives:** 1. Sinus injury can range from minor to major lacerations and the risk of blood loss and air embolism could be lethal.

2. Follow-up is crucial to prevent long-term complications.

**Background:** The sinus laceration is a disastrous complication in craniotomies involving venous sinuses. Blood loss and venous air embolism can lead to mortality and morbidity. Therefore, achieving hemostasis and repairing the sinus is crucial. In this study, we will present a case of retrosigmoid craniotomy that was complicated by transverse and sigmoid sinus lacerations.

**Methods:** A 46 years-old female with trigeminal neuralgia, that is resistant to drugs and radiofrequency ablation therapy. Microvascular decompression of the left trigeminal nerve with a retrosigmoid approach in a prone position was performed.

**Results:** The transverse sinus was injured after placing the first burr hole to the inferomedial of the asterion, but hemostasis was obtained with gel foam and cottonoids. Later while turning the craniotomy, there was abundant bleeding from the sigmoid sinus. Bone wax was applied with gel foam and large cottonoids, followed by the elevation of the head of the bed. The bleeding slowed down, and there was no sign of air embolus so the craniotomy could be completed. Although the sigmoid sinus could not be sutured, hemostasis was obtained using Hemopatch and gel foam. Ultrasonic Doppler was used to confirm the flow of the sinus. The operation proceeded without any other significant complications and the patient was discharged without any neurological deficits.

**Conclusions:** Sinus injury can range from minor to major lacerations and should be taken seriously since the risk of blood loss and air embolism could be lethal. Proper follow-up is crucial to prevent long-term complications such as sinus thrombosis and dural arteriovenous malformations.

## Global Neurosurgery

ePoster presentation

### Assessing the neurosurgical capacity in Nigeria using the modified Neuro-PIPES tool

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**Objectives:** This study aimed to (1) assess the capacity for the delivery of neurosurgical services in Nigeria, and (2) identify areas of need that would benefit from collaborative global neurosurgery interventions.

**Background:** Like many low-and-middle-income countries in Africa, documented assessment of the neurosurgical workforce, equipment, infrastructure, and scope of service delivery in Nigeria is lacking.

**Methods:** A 5-section, 83-question, online survey was disseminated to neurosurgeons and residents in Nigeria. The survey included a 21-question capacity assessment section that used the modified Neuro-PIPES (MN-PIPES) tool to evaluate the availability of neurosurgical personnel, infrastructure, procedures, equipment, and supplies. Comparative analysis was done using the domain and total MN-PIPES scores and MN-PIPES index.

**Results:** 4% of the institutions exceeded the national average personnel score, 52% surpassed the national average infrastructure score, and 50% superseded the national average procedure score. Also, 56% surpassed the national average equipment score, 64% scaled the national average supplies score, and 44% exceeded the national average MN-PIPES score and index. Survey respondents reported that the main challenges impeding neurosurgery service delivery were a lack of adjunctive supplies (75.2%), a dearth of diagnostic and interventional equipment (72.4%), and the absence of a dedicated intensive care unit (72.4%).

**Conclusions:** There is uneven availability of workforce, infrastructure, equipment, and supplies needed to provide optimal neurosurgical care in many institutions in Nigeria. While major strides have been made in recent years, targeted collaborative interventions at local, national, regional, and international levels will further improve neurosurgical service delivery in the country and will have a ripple positive impact on the rest of the health system.



## Oncology

ePoster presentation

Avoidance of dural defect related complications using NHS-PEG collagen material for dural defect - a case series of 30 patients

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**Objectives:** Objective of this study is to share our experience of 30 patients in managing dural defects using NHS- PEG collagen in our surgical unit.

**Background:** CSF leak and pseudomeningocele are commonly seen complications post surgery. These complications lead to dreadful events like Meningitis. We used NHS-PEG collagen material to close all sizes of dural defects for supratentorial, infratentorial, skull base, endoscopic and spinal surgeries. NHS- PEG has hemostatic property and doesn't require suturing for fixation.

**Methods:** We included 30 patients in this study in a tertiary care centre. We included supratentorial, infratentorial, skull base, endoscopic and spinal tumour surgeries. All surgeries were done in a single surgical unit. All patients had significant dural defect and were closed with the help of NHS- PEG collagen material. Dural defect was measured intra-operatively and Over lay Duroplasty done.

**Results:** None of the patient had CSF leak or pseudomeningocele in our study. There were no rejections and material related complications. NHS-PEG collagen was also used in emergency cases in deranged bleeding parameters as NHS-PEG has hemostatic property as well. This material doesn't require any fixing material like suturing due to its adhesive property, hence decreasing operative time.

**Conclusions:** 1) Natural pedicle graft is the best substitute for dura in dural defects, however it has many practical constraint.

2) NHS-PEG collagen has significant benefits as a dural supplement to avoid CSF leak and pseudomeningocele, hence avoid meningitis.

## Trauma

Oral presentation

### Clinical application of augmentative craniotomy, a novel technique for the treatment of intracranial hypertension

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**Objectives:** In this work, we aimed to assess a novel tool that could replace a decompressive craniectomy. By maintaining the bone flap elevated with particular cranial suspension titanium plates and allowing the brain adequate room to swell, this device is intended to execute an augmentative craniotomy.

**Background:** In patients with untreatable cerebral edema, decompressive craniectomy is a technique with a proven efficacy. This technique, however, is associated with a high complication rate and requires a subsequent cranioplasty operation that can be invasive and expensive.

**Methods:** The mechanical properties of the cranial brackets were evaluated using dried skulls, 3D-printed skull models, and a preserved cadaver head. The resistance of the device was assessed via dynamometric testing, while the viability of the surgical technique, encompassing bone flap suspension and skin closure, was explored using the cadaveric model. A computerised study of the cranial volume gained from the operation was carried out and compared with the standard decompressive craniectomy technique. A clinical series of patients undergoing this novel operation is presented.

**Results:** The laboratory tests have shown that this system allows an adequate expansion of the intracranial volume with adequate resistance. The computer simulation showed that the cranial volume after elevation of the flap was superior to that acquired with standard technique ( $p < 0.1$ ). The clinical series showed that augmentative craniotomy is effective in the control of intracranial hypertension and could reduce the costs and complications associated with the classical decompressive craniectomy technique.

**Conclusions:** Preliminary clinical results and laboratory testing show that augmentative craniotomy is a promising, alternative technique to decompressive craniectomy.

## Trauma

Oral presentation

### Management of acute cervical spinal cord injuries: a systematic review of 1637 cases

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**Objectives:** To describe the aetiopathogenetic mechanisms, neurological and anatomical level distribution, severity, treatment and outcomes of acute cervical spinal cord injury (ACSCI).

**Background:** >50% of acute traumatic disruptions of the spinal cord and its coverings are cervical (mostly atlantoaxial but also subaxial). Residual neurological deficits usually persist, with up to 6.2 million Years Lived with Disability. With the aetiology in 60%, fairly evenly distributed between road traffic crashes and occupational injuries, the traumatic mechanisms and management need to be clarified.

**Methods:** We systematically reviewed PubMed and Cochrane CENTRAL on 16th May 2023, using a prospectively registered protocol (CRD42023417530). The search strategy combined search words (from the keywords; 'cervical spinal cord injury', 'conservative' and 'operative' 'treatment') using boolean operators. These yielded 787 and 55 records from PubMed (then 223 after delimiting to 10 years) and CENTRAL respectively; 106 and 1 record were relevant respectively after records screening. 76 reports were recruited for the quantitative synthesis following fulltext review and methodological quality/bias assessment (using Joanna Briggs Institute critical appraisal tools).

**Results:** 1637 cases were pooled from 76 reports [case reports (37), series (34) & 5 cohort studies. Weighted-mean age was 46.24 years (n=1484) with male (70.24%; n=1074) preponderance. ACSCI were mostly caused (n=1079) by falls (42.08%) and road traffic crashes (42.17%). The commonest vertebral levels were c5 (26.78%; n=1027), c6 (23.86%) and c2 (22.59%). There were some non-operative [Gardner-Wells tongs(47.40%), Halo brace(23.04%); n=907], but mostly operative (70.90%; n=897) treatment; following traction (71.03%), using anterior (47.59%; n=1265), posterior (14.47%) and combined (8.22%) implant-based arthrodeses. Bony union (90.48%) and neurological improvement (45.35%) were reported.

**Conclusions:** Mostly low-level evidence showed ACSCI occurring more amongst the middle-aged and men; following falls or road traffic crashes. The fifth, sixth and second cervical vertebrae are most affected with excellent bony-union, but moderate neurological outcomes. International ACSCI reporting standards were poorly used.

## Spine

ePoster presentation

Longer duration of corticosteroid use is associated with increased odds of cervical deformity in patients with Rheumatoid Arthritis

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**Objectives:** To evaluate the influence of duration of corticosteroid use during 10 years of follow-up (FU) on the prevalence of cervical spine deformity in patients with Rheumatoid Arthritis (RA).

**Background:** Patients with RA are often prescribed corticosteroids such as prednisone, which are used in higher dosed bursts or as a lower dose over a longer period of time as a bridging therapy. However, long term use of corticosteroids has been shown to increase the risk of osteoporosis and fractures. The exact influence of corticosteroid use on the prevalence of cervical spine deformity is yet to be determined.

**Methods:** This study uses data of the BeSt Trial. The duration of corticosteroid use during 10 years was calculated for each patient, as they were seen every 3 months. Missing values were imputed using last observation carried forward. Lateral X-rays at 5 and 10 years FU were assessed for Atlantoaxial Subluxation (AAS) and Subaxial Subluxation (SAS). Odds Ratios (OR) obtained from logistic regression were corrected for age at baseline, gender, ACPA-positivity and RF-positivity.

**Results:** 272 patients were included and mild cervical deformity (AAS and/or SAS >2 mm) was observed in 108 patients (40%). 147 patients (54%) used corticosteroids during 10 years FU, with a median duration of 15 months (IQR 3-11 months). The OR of cervical spine deformity after 10 years was 1.045 (95% CI: 1.008-1.083; p=0.015) for an increase in duration of corticosteroid use of 3 months (1 visit).

**Conclusions:** This study shows that there is an increased odds of cervical spine deformity after 10 years for every 3 months of corticosteroid use. So, while corticosteroids are known to have a beneficial effect on disease control and overall disease activity, caution should be used in prescribing corticosteroids for long periods of time as the odds of cervical spine deformity seem to increase in RA-patients.

## Paediatric

Oral presentation

A multicentre clinicopathological review of paediatric posterior fossa tumours in a developing country over eighteen years

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**Objectives:** To analyse the clinical features (on first presentation), histopathology and outcomes in a series of patients less than 18 years with posterior fossa tumours diagnosed over 18 years.

**Background:** Posterior fossa tumours are amongst the most common childhood neoplasms with an incidence of 2 to 3.5 per 100,000. They are considered critical brain lesions primarily due to limited space in the posterior fossa and their tendency to cause obstructive hydrocephalus. These tumours remain relevant as they make up a significant portion of paediatric neurosurgery referrals today.

**Methods:** A retrospective study was undertaken across two major neurosurgical centres, and eighty-five cases were evaluated over 18 years. Following the Ethics Committee's approval, the patients were identified via the brain tumour registry and the pathology departments. Patients aged less than 18 years with posterior fossa tumours were included. Multiple variables were analysed, including demographics, clinical features, Karnofsky score at first presentation, radiology (location of neoplasm, presence of hydrocephalus on initial scan), treatment, tumour histopathology and factors affecting survival.

**Results:** Of the 85 cases, 55% (47 patients) were female and the mean age of diagnosis at 7.42 years (SD ± 4.04 years). The main presenting symptoms were cerebellar signs (56%), headaches (54%) and intractable nausea/ vomiting (38%). Seventy-two percent also had obstructive hydrocephalus. The tumour's location was predominantly in the cerebellar hemisphere (45%), and most were astrocytomas (34%). Tumour histopathology was the only independent predictor of survival of the variables analysed, where patients with medulloblastoma and brainstem glioma were more likely to have a fatal outcome.

**Conclusions:** Anatomical location of the tumour, histopathology and patients presenting with nausea or vomiting were associated with a poorer outcome; however, the only independent predictor of survival was the histopathology.

## Spine

Oral presentation

Thoracholumbar fracture, short fixation with pedicular screw in vertebral fracture

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**Objectives:** The study suggests that the placement of pedicle screws in the fractured vertebra makes the need for shorter fixation

**Background:** Thoracic and lumbar fractures account 50% for all spinal traumatic fractures. Incidence of Th-L fracture is 4 per 100 000 person-year and peak age 18-35. The causes of thoracolumbar fracture are different depending on patient's age. High energy trauma, fall from height Sport accident Violent act Osteoporosis Tumors Other underlying conditions that weaken bone. The treatment can be surgical and non-surgical. There exist many surgical methods to treat. The goal is to optimize neural decompression while providing stable internal fixation over the least number of spinal segments. Short-segment constructs through a single-stage approach (anterior or posterior) have become viable options with advances in instrumentation and techniques

**Methods:** In this retrospective study we analyze 940 patients between February 2006 1 January 2023 who had sustained fracture dislocation of the thoracolumbar spine and received single stage posterior surgery.

**Results:** The implant failure rates for patients treated with pedical screw fixation: 2 levels (one up and one below fracture) 4% 3 levels (with fracture included) 3.5% 3 levels (2 up and one below without fracture included) 3.2% 4 levels 3.5 %. There was no significant difference on implant failure rate between the two groups.

**Conclusions:** The study suggests that the placement of pedicle screws in the fractured vertebra makes the need for shorter fixation. The study also reveals that in the case of traumatic fractures fixation can be done without fusion in specific group of patients. Young patient and neurologically intact, with posterior ligamentous complex preserved.

## Oncology

Oral presentation

### Hyperspectral imaging for intra-operative characterisation of brain tumours, margins and eloquent connectomes

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**Objectives:** To clarify the role of Hyperspectral Imaging (HSI) during neurosurgical procedures.

**Background:** The identification of intrinsic brain tumours' boundaries and their anatomical relationship with eloquent connectomes is one of the main challenges in neurosurgery. Several new intra-operative spectroscopic technologies have been recently investigated for this purpose. HSI is based on analysis of reflected light, divided in specific wavelengths ranges across the electromagnetic spectrum. By doing so, it can identify wavelengths invisible to the naked eye, and make them visible by applying specific filters.

**Methods:** We have used HSI to acquire intraoperative images during brain tumours surgeries. The HSI camera has been adapted to be connected to the intra-operative microscope and acquire a stack of images of different spectra to be analysed on a separate time. The focus of the images acquisition includes tumour structure, its margins, and eloquent connectomes during awake surgery or neurostimulation to analyse the possibility of different perfusion signal during activation. A deep learning (DL) algorithm has been used to analyse the stack of images and detect structural information and identify tumour's area and tumour's margins, while oxygen maps have been created using linear least squares regression to detect areas of metabolic activity based on the Beer-Lambert law.

**Results:** Forty-seven patients have been enrolled in the current study at the time of this submission. Our preliminary results show that HSI is a potential additional technology to visually show tumour core, margins, and different degree of perfusions on the tissues analysed during tumour surgery. Although on a very limited subgroup of patients, HSI seems to be reliable in identify eloquent areas activation during awake surgery. These results are promising and warrant more data acquisition to be confirmed.

**Conclusions:** HSI is a promising technology to be added to neurosurgical toolkit for tumour resection and eloquent brain delineation.

## Education, Ethics, Socioeconomic

Oral presentation

The status of specialist neurosurgical training in Nigeria: a survey of practitioners, trainers and trainees

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**Objectives:** This study sought to (1) assess the current status of specialist neurosurgical training in Nigeria, and (2) evaluate the perception of Nigerian neurosurgeons and trainees on the content, processes, and challenges of neurosurgery training in Nigeria.

**Background:** Despite the well-known neurosurgical workforce deficit in Sub-Saharan Africa, there remains a low number of neurosurgical training programs in several countries, including Nigeria.

**Methods:** A 5-section, 83-question, electronic survey was distributed to all consultant neurosurgeons and neurosurgery residents in Nigeria. The survey included a 27-question training section that explored the demography, content, process, strengths, and challenges of neurosurgical training in Nigeria. Descriptive statistics were used for analysis.

**Results:** Respondents identified 15 neurosurgical training centers in Nigeria. All 15 are accredited by the West African College of Surgeons (WACS), and 6 by the National Postgraduate Medical College of Nigeria (NPMCN). The training centers have a capacity for 70 trainees but are over-subscribed with 94 residents currently in training. The average duration of core neurosurgical training was 5 years. Some identified strengths of the training program included multiple learning opportunities provided to residents, recent growth in the neurosurgical training capacity, and satisfaction with training. Challenges included a continued low number of training programs compared to the population density, lack of subspecialty training programs, and inadequate training infrastructure.

**Conclusions:** Despite the relatively high number of neurosurgery training centers in Nigeria, compared to other West African countries, the programs are still limited in number and capacity. Although this study shows apparent trainee satisfaction with the training process and contents, multiple challenges exist. Efforts at improving training capacity should focus on continuing the development and expansion of current programs, commencing subspecialty training, driving health insurance to improve funding, and increasing available infrastructure for training.



## Global Neurosurgery

ePoster presentation

### Intraoperative use of low field MRI for brain tumor imaging: a systematic review

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**Objectives:** This systematic review aims to investigate the impact of low-field strength intraoperative magnetic resonance imaging (LF-IMRI) on the duration of brain tumor surgery and the extent of tumor resection.

**Background:** Low-field MRI (LF-MRI) has become a valuable tool in the diagnosis of brain tumors due to its high spatial resolution and ability to acquire images in a short amount of time. However, the use of LF-MRI for intraoperative imaging during brain tumor surgeries has not been extensively studied.

**Methods:** A comprehensive literature search was conducted using PubMed, Scopus, and Google Scholar from February 2000 to December 2022. The studies were selected based on the inclusion criteria and reviewed independently by two reviewers. The gathered information was organized and analyzed using Excel.

**Results:** Our review of 21 articles found that low-field intraoperative MRI (LF-IMRI) with a field below 0.3T was used in most of the studies, specifically 15 studies used 0.15T LF-IMRI. The T1-weighted sequence was the most frequently reported, and the average scanning time was 24.26 minutes. The majority of the studies reported a positive impact of LF-IMRI on the extent of tumor resection, with an increase ranging from 11% to 52.5%. Notably, there were no studies describing the use of ultra-low-field intraoperative MRI (ULF-IMRI).

**Conclusions:** The results of this systematic review will aid neurosurgeons and neuroradiologists in making informed decisions about the use of LF-MRI in brain tumor surgeries. Further research is needed to fully understand the impact of LF-MRI in brain tumor surgeries and to optimize its use in the clinical setting. There is an opportunity to study the utility of ULF-MRI in brain tumor surgeries.

## Peripheral

Oral presentation

### Management strategies of obstetrical brachial plexus injuries

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**Objectives:** This study was designed to evaluate the outcome of microsurgical repair in babies suffering from obstetrical brachial plexus palsy (OBPP) especially the shoulder recovery and also to compare different microsurgical techniques in total and upper palsy .

**Background:** Although obstetrical brachial plexus injuries is almost always mild the sever injuries are still unsolved surgical challenge.

**Methods:** This study was conducted in neurosurgery department Mansoura University hospital ,from March 2016 to January 2019 25 patients subdivided into two groups. Group one included 16 patients presented with total OBPP palsy .Group two included 9 patients presented with upper OBPP palsy . All of them underwent thorough history taking ,several laboratory , radiological and electrophysiological investigations and finally plexus exploration and microscopic repair.

**Results:** Follow up of our patients showed satisfactory shoulder recovery in 73.33% Of our patients after microsurgical repair which is superior to natural history of the disease . By comparing the results of functional recovery in both groups shoulder recovery was more or less better in group two.

**Conclusions:** Microsurgical repair in OBPP will lead to satisfactory improvement of arm function.

## Oncology

ePoster presentation

### The MRPS18-3 gene is highly expressed in glioblastoma/high grade diffuse glioma

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**Objectives:** To evaluate relative expression of the MRPS18 family genes in high grade glioma samples; to relate mRNA expression levels in cancer tissue and in peripheral blood with clinico-pathological characteristics of tumor samples.

**Background:** Diffuse gliomas is a type of brain tumors that is rising from astrocytes in the cerebrum. Diffuse astrocytomas in children have their own characteristics, especially in young children (up to 3 years old). This form represents only about 2% of all astrocytomas. Approximately 70% consists of very aggressive, type IV gliomas, also called glioblastomas. Except few molecular markers, such as the methylated promoter of the *MGMT* gene, mutated *IDH1*, and highly expressed *TERT*, not much is used to prognose the patient survival. We studied genes of the MRPS18 family as putative molecular prognostic markers for the high-grade gliomas.

**Methods:** Expression patterns of the MRPS18 family genes was studied, using RT-qPCR on the total RNA isolated from surgical tumor samples and peripheral blood of cancer patients. A statistical analysis was performed with the help of a GraphPad Prism software.

**Results:** We have found that the MRPS18 family genes are differentially expressed in glioma samples, compared to the control - conditionally normal brain and peripheral blood of a healthy donors. We demonstrated similarity in the gene expression pattern in tumor tissue samples and in peripheral blood of patients with glioma, especially for the *MRPS18-3* gene. *MRPS18-3* was highly expressed in high grade gliomas, in contrast to significantly lower expression in the low-grade tumors and in the control.

**Conclusions:** The results of the present work suggest that relative mRNA expression levels of *MRPS18-3* in tumor tissue and in peripheral blood could be used for the prognosis of a course of the disease. More work should be done, and on a larger cohort of high-grade glioma patients.

## Global Neurosurgery

ePoster presentation

### Diagnosing tethered cord when MRI is not possible: a technique from the past

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**Objectives:** 1. Tethered cord can also be seen in adulthood.

2. CT myelogram is a diagnostic tool for patients when MRI is counter-indicated.

**Background:** Tethered cord is a developmental defect typically identified in the early years of life, along with motor function loss, gait problems, and urine abnormalities. In adulthood, the clinical characteristics do not differ; however, late diagnosis could lead to scoliosis with vertebra degeneration.

Magnetic resonance imaging (MRI) is the gold standard diagnostic tool, depicting the thick filum and the position of the conus medullaris. MRI is not an option in the cases of metallic aortic valves. We present an adult case of spinal dysraphism with a metallic aortic valve.

**Methods:** A 32-year-old male with Marfan syndrome and a metallic aortic valve presented with urinary incontinence, erectile dysfunction, and gait abnormalities. He complained of difficulty standing upright with the tension in his neck. He had a history of an aortic aneurysm rupture that caused motor loss of right foot dorsiflexion. Inspection revealed he had hair tuft on the lower lumbar-sacral region. His urodynamic test pointed out a neurological condition. EMG revealed chronic radiculopathy. Computed tomography (CT) depicted degenerative scoliosis with a tarlow cyst. Since MRI scanning was counter-indicated due to the metallic aortic valve replacement, a CT myelogram was obtained, which revealed a closed spinal dysraphism with a thick filum terminale suggestive of a tethered cord syndrome.

**Results:** The surgery revealed a thick, fat-rich filum terminale with closed spinal dysraphism. Untethering of the filum terminale with the reconstruction of the spinal dysraphism was performed. He was discharged with improvement in gait.

**Conclusions:** CT myelogram is still viable in selected diagnoses when MRI scanning is counter-indicated. Tethered cord is not a pathology restricted to only childhood and early adulthood. It should be considered among adult cases with stigmas and associated symptoms.

## Global Neurosurgery

ePoster presentation

The scope, trends, and challenges of neurosurgical research in Nigeria: a bibliometric review

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**Objectives:** This study

(1) investigates the scope, trends, and challenges of neurosurgical research in Nigeria over the past 60 years, and (2) identifies collaborative interventions that would enhance the neurosurgical research capacity in Nigeria and other LMICs.

**Background:** Epochal trends in the growth of neurosurgery in Nigeria have occurred since the subspecialty was founded in 1962, leading to sustainable growth in neurosurgical research capacity in the country.

**Methods:** A bibliometric review of the neurosurgical literature from Nigeria was done. Variables extracted included year and journal of publication, article topic, article type, research type, study design, article focus area, and limitations. Descriptive and quantitative analyses were performed for all variables. Trends of research publications were described in three periods - *pioneering* (1962-1981), *recession* (1982-2001), and *resurgent* (2002-2021).

**Results:** Of the 1023 included articles, 10.0% were published in the pioneering period, 9.2% in the recession period, and 80.8% in the resurgent period. Papers were predominantly published in World Neurosurgery (4.5%) and Nigerian Journal of Clinical Practice (4.0%). 79.9% of the 4618 authors were from Nigerian institutions. 86.3% of the articles covered clinical research and were mainly focused on service delivery and epidemiology (89.9%). The most prominent topics were traumatic brain injury (25.8%) and CNS malignancy (21.4%). Only 4.4% of the publications received funding, mostly from agencies in the US (31.7%). Barriers to neurosurgical research included a lack of clinical databases (18.0%), an increasing burden of disease (12.5%), and diagnostic challenges (12.4%).

**Conclusions:** Neurosurgical research in Nigeria continues to grow due to increased training, workforce, and infrastructural improvements. Addressing the major challenges through establishment of research databases, development of evidence-based management guidelines, and increasing research training, funding and opportunities can increase research capacity in Nigeria.

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## Oncology

ePoster presentation

Intra-operative applications of optical imaging in neurosurgery: a developing field?

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**Objectives:** To explore the relevant literature regarding intra-operative optical imaging in neurosurgery.

**Background:** The neuro-surgical community is witnessing a rising interest for surgical application of optical imaging, such as hyperspectral, multispectral, near infrared and fluorescence. The technical characteristic of each specific technology is variable, and so is the potential clinical target and the benefit. We present an updated literature review and critical appraisal of the most promising applications of optical imaging in neurosurgery.

**Methods:** A literature search based on the PRISMA principles was performed on PubMed, Web of Science and SCOPUS, using keywords (multispectral, hyperspectral, optical imaging, etc.) and Boolean operators. Papers regarding intra-operative in-vivo application of optical technologies in humans during neurosurgical procedures were included. Papers studying technologies related to radiological applications were excluded. We have also excluded literature regarding stand-alone standard usage of 5-ALA, as there is proven clinical benefit, but we did include the usage of 5-ALA in combination with optical imaging technologies.

**Results:** Our search string retrieved 38 papers. A further screening resulted in the inclusion of 16 clinical papers. The main applications of optical imaging during neurosurgery concern:

- 1) tumour detection and improvement of the extent of resection – 7 papers;
- 2) visualization of perfusion changes during epilepsy, neuro-oncology, and neuro-vascular surgery – 8 papers;
- 3) visualization of neural activity – 1 paper. All the retrieved articles were pilot studies, proof of concepts, or case reports, with limited number of patients recruited. Sensitivity, specificity, and accuracy were promising in most cases, but the data presentation is not homogeneous, and the approaches used for data analysis is variable.

**Conclusions:** The present review shows that several approaches are currently being investigated to provide optical imaging as an additional tool during neurosurgical procedures, but most of the studies show a limited number of patients and variable methods, making it desirable to collect further evidence.

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## Spine

ePoster presentation

### Cervical spine fractures

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**Objectives:** This was a retrospective review of the surgical management of cervical fractures (supra and subaxiale) in our clinic, during the period of 2006-1 January 2023.

**Background:** In the period of 16 year, in our clinic have been treated about 518 cases, from which 399 males and 119 females. The patients age range from 11-84 old, with an average of 35 years old.

**Methods:** The main cause of fractures is the car accident followed from falls from altitude, jumps into the sea with head etc. 478 patient had subaxial cervical fractures and 40 patient upper cervical fractures. The neurological state of the hospitalized patients has been evaluated based on ASIA scale. Depending on the level of fracture and medical condition different surgical techniques are applied. From the patient with subaxial fractures, 438 patients were treated with anterior and 60 with posterior approach. 107 patients underwent anterior corpectomy and 331 were treated only with anterior decompressive discectomy. The PEEK CAGE and titanium mesh was used in 290 patients and 166 patients iliac bone was used.

**Results:** From 40 patients with upper cervical fractures 10 patients were treated with C2 anterior single screw fixation, 7 patients with transarticular screw fixation (Magerl) 15 with c1-c2 posterior fusion and 8 patients with posterior occipital cervical fusion.

**Conclusions:** The surgical management of cervical fractures aims the decompression of the nerve structure and fixation of the cervical spine in the correct and stable position. This procedure may be realized with different techniques depending on the level of fracture, age and health condition, and availability of instruments.

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## Hydrocephalus

Oral presentation

Multicentre evaluation on the use of a locking-device for External Ventricular Drain

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**Objectives:** Here, we explain the application of a novel technique—the "catheter-locking device -assisted" EVD placement—while presenting the results of an early, single-center observational study.

**Background:** In order to redirect cerebrospinal fluid (CSF) and track intracranial pressure, neurosurgical patients typically have external ventricular drains (EVDs) placed. The tunneled EVD approach used in the operating room is the standard procedure. There have also been reports of EVD insertion through a bolt in intensive care units.

**Methods:** From January 2021 to February 2023, 32 patients underwent a "catheter-locking device-assisted" EVD placement at our institutes. For each of these patients, the following data were evaluated:

- (1) demographics,
- (2) etiology,
- (3) clinical presentation,
- (4) EVD complications, and
- (5) final clinical outcomes.

**Results:** Median age of our population was 61 years, with a female/male ratio of 2:1.4. Average Glasgow Coma Scale score on admission was 9. Each patient maintained the drainage for an average time of 14 days. None of the patients suffered from postoperative intracerebral hemorrhage, CSF leakage, catheter migration, or discontinuation of the drainage system; none developed signs of infection. 18 patients required a permanent CSF diversion system. Outcome was good in 18 patients. Three patient died for the underlying disease.

**Conclusions:** The usual tunneled and bolt-assisted EVD insertion techniques appear to be risky and inaccurate compared to the "catheter-locking device-assisted" EVD installation. Although more research is needed, it is possible that using this method will greatly reduce the incidence of the most typical EVD problems.



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## Oncology

ePoster presentation

Does the residual tumor volume percentage affect survival in IDH negative glioblastoma: retrospective study

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### Objectives:

1. Not many studies investigate factors affecting pure IDH-negative gliomas' survival.
2. Whether resection extent affects survival is an essential decision.

**Background:** In 2021, the World Health Organization classified IDH-negative gliomas as glioblastomas. Although the effect of extensive surgery on survival in high-grade glial tumors is known, the relationship between residual tumor volume and prognosis in this subgroup (IDH-negative) is not clearly reported. This study aims to determine whether the extent of resection also significantly impacts survival in IDH-negative gliomas.

**Methods:** The adult patients with IDH-negative glioblastoma operated on by the same senior surgeon between July 2018 - August 2022 were analyzed retrospectively. Patients that didn't receive adjuvant therapy or didn't have postoperative imaging were excluded. Demographic data, survival, and modified Rankin score were collected. Tumor volume and residual tumor volume were measured by using Eclipse (v18.0) radiotherapy planning software. Residual tumor percentage was calculated by taking the ratio of the remaining tumor volume to the primary tumor volume.

**Results:** 37 patients enrolled in this study, with a mean age of  $63.73 \pm 11.00$ . The preoperative and postoperative median tumor volumes were  $48.69 \pm 30.67$  and  $3.90 \pm 4.94$  cm<sup>3</sup>, respectively. The median survival time was 9 (IQR= 15) months. Preoperative modified Rankin score had a mean of  $2.38 \pm 1.28$ ; postoperatively,  $2.65 \pm 1.53$ .

The mean residual tumor percentage was  $9.12 \pm 12.12\%$ . The patients were divided into two groups accordingly. A Kaplan-Meier survival analysis revealed that patients with less residual tumor (n=22) had a median survival time of 14 months compared to the more residual tumor group, 5 months (n=15) (p=0.025). Less residual tumor was associated with longer survival (r: -0.290, p=0.012), while age, modified Rankin score, and tumor volume didn't affect survival.

**Conclusions:** In this study, the extent of resection significantly affected the survival rate of IDH-negative glioblastomas. Gross total tumor removal should be achieved for more prolonged survival.

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## Trauma

Oral presentation

Is dural closure necessary in post traumatic decompressive craniectomy? A randomized study

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**Objectives:** 1 – To find out if dural closure is necessary after decompressive craniectomy (DC).

2 - Is there any increased morbidity if dura left open after DC.

**Background:** Different centres adopt different policy for dural closure after post traumatic DC. Few centres prefer water tight closure while others left dura open after DC.

The present study compared dural open and closed surgical procedures for DC and their relationship with Glasgow Coma Scale (GCS) and Glasgow Outcome Scale (E) (GOS-E) scores and survival in prospective randomized controlled TBI patients.

**Methods:** The patients were randomized into test; with dural closure (CD) (n = 60) and control without dural closure (OD) (n = 60) groups. After decompressive craniectomy, patients were monitored daily until hospital discharge or death and for three months. GSC/E leakage, infection, and functional status were also assessed.

**Results:** 120 patients aged 10-65 (36.97 ± 13.23) with DC were enrolled in the study. Age (p = 0.795), sex (p = 0.104), mode of injury (p = 0.195), GCS score (p = 0.40, p = 0.469), Rotterdam score (p = 0.731), and preoperative midline shift (MLS) (p = 0.378) did not vary between the OD and CD groups. Neither technique affected the mortality, motor score, or pupil response (p > 0.05). Intracranial pressure, brain bulge, GCS score, and MLS were not associated with the operative method (p > 0.05). The open dural group had a significantly shorter procedure time than the closed dural group (P = 0.026). Both groups showed no significant difference (p > 0.05) between CSF leak and post-traumatic hydrocephalus.

**Conclusions:** Dural open surgery for decompressive craniectomy is shorter and not associated with significant surgical consequences compared to close dural close surgery.

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## Trauma

ePoster presentation

Predictive role of leukocyte count in traumatic brain injury: a retrospective study from a tertiary care hospital of Lahore, Pakistan

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**Objectives:** To investigate the association between leukocyte count and the severity of blunt traumatic brain injury (TBI).

**Background:** Traumatic brain injury (TBI) is the leading cause of disability and mortality worldwide. The prognosis of TBI is determined by various predictors, which help to triage patients and channel healthcare resources accordingly for better patient outcomes. Recently, the leukocyte count has emerged as a prognostic factor.

**Methods:** Records for complete blood count (CBC), Glasgow Coma Scale (GCS), Glasgow Outcome Score (GOS) and radiological assessment of intracranial haemorrhage were retrieved. The parameters were assessed on the day of presentation, third and fifth post admission day. Patients were classified into three categories of TBI based on their GCS and clinical features at the day of presentation.

**Results:** The mean white blood cell count (WBCC) was raised above the normal range on presentation day in all three TBI categories, i.e. 14,645/L in mild TBI; 16,075/L in moderate TBI and 13,176/L in severe TBI. The mean WBCC for mild, moderate and severe TBI on third post-admission day were 13,731/L, 15,056/L and 14,583/L respectively. While on the fifth post-admission day, the WBCC was 13,005/L, 13,773/L and 14,763/L for mild, moderate and severe TBI in order.

**Conclusions:** Our study has demonstrated that leukocytosis in patients with a traumatic head injury is prognostic for prolonged hospitalization and adverse clinical outcomes. The mean WBC count settled for mild and moderate TBI, while it increased for severe TBI over a period of five days.

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## Oncology

ePoster presentation

### Mixopapillary ependymoma: atypical presentation

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**Objectives:** To report a case of mixopapillary ependymoma.

**Background:** Patient, male, 25 years old, presented bilateral lumbosciatic pain for 2 years with progression to sensory and motor loss in lower limbs and sensory level at T10 and crural paraparesis, with muscle strength equal to III, with urinary retention and fecal incontinence. Magnetic resonance imaging (MRI) examinations revealed an expansive lesion, which occupied the entire vertebral canal from T10 to S1. We performed a subtotal intradural tumor resection, mainly due to the involvement of the medullary cone and the roots of the cauda equina. Histopathologic examination revealed a Myxopapillary Ependymoma (ME).

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2022.

**Results:** Initially described by Kernohan in 1932, ME is a distinct subtype of medullary ependymomas that has a predilection for the lumbosacral region and arises from the ependymal glia of the filum terminale. It represents 1% to 5% of all spinal neoplasms and approximately 13% of all spinal ependymomas, accounting for 90% of all tumors in the medullary cone. ME are characterized by an indolent and slow clinical course, with a nonspecific presentation, which usually courses with radicular pain that worsens at night and in the position rest. In the case described, it was indolent, but affected from the thoracic to the sacral region.

**Conclusions:** The relevance of this case lies in the unusual and extensive involvement of the spinal cord, which occurred from T10 to S1. Due to the rarity of ME, there are no definitive treatment guidelines. However, there is a consensus that total excision of the primary tumor is the most important factor in treatment and prognosis. Unfortunately, if untreated, these lesions have poor prognosis and result in clinical symptoms such as [paraparesis](#).

## Global Neurosurgery

Oral presentation

### Epidemiological burden of neurosurgical diseases in Nigeria: a systematic review and pooled patient analysis

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**Objectives:** Describe the epidemiology of the prevalent neurosurgical conditions in Nigeria.

Generate standardized reference for future neurosurgical research and practice in Nigeria.

**Background:** Neurosurgical diseases cause significant morbidity and mortality in Nigeria, however, standard epidemiological reference is lacking.

**Methods:** Four databases and gray literature sources were searched. Descriptive, narrative synthesis, and statistical analyses were performed where appropriate.

**Results: Neurotrauma:** 45,763 patients from 254 articles were included. 90% had TBI, mainly from RTAs (68.6%). Altered consciousness (48.4%) was the main feature. CT (53.5%) was the main imaging, with skull (25.7%) and vertebral fractures (14.1%) the major findings. Two-thirds were treated non-operatively. Outcomes were favorable in 63.7% and 20.9% of TBI and TSI patients, respectively.

**Pediatric neurosurgery:** 12,295 patients from 196 publications were included. Main feature was altered consciousness (7.7%), with CT (38.8%) the main imaging. Congenital anomalies were prevalent (60.2%). 57.5% received surgery, mainly VP shunt placement (36.4%). GOS (95.7%) was primary outcome measure, with positive outcomes in 59.3%.

**Spinal neurosurgery:** 8425 patients from 127 articles were analyzed. 45.0% had complete spinal impairment. Pain (41.7%) was the main feature, X-rays (45.1%) the major investigation, and intervertebral disc herniation (18.9%) the prevalent finding. Most were managed nonoperatively (57.8%), with favorable outcome of 27.4%.

**Neuro-oncology:** 147 studies with 5760 patients were included. Meningiomas and gliomas were the main tumors, CT the main imaging, and surgery the primary treatment. Complications included seizures and speech impairment, and mortality was 11.1%.

**Vascular neurosurgery:** 3203 patients from 56 articles were pooled. Headache was the major feature, and CVA (85.0%) was the main diagnosis. X-ray and carotid angiography were the primary imaging. Aneurysmal clipping was the main treatment. The outcome was favorable in 48.3%.

**Conclusions:** This study highlights the epidemiological burden of neurosurgical pathologies in Nigeria and raises awareness of the prevalence, management, attendant challenges, and epochal trends over the past 60 years.

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## Spine

Oral presentation

Intraoperative neurophysiology monitoring for intradural extramedullary tumours - is it useful?

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**Objectives:** We retrospectively reviewed all the cases of spinal tumours operated in our institute by a single surgeon from April 2008 to March 2023. Our experience with intra-operative neurophysiology monitoring is reported and critically discussed.

**Background:** Spinal cord and nerve roots monitoring has become standard of care during spinal deformity correction and intramedullary tumour removal. It has also been used during surgical removal of intradural spinal tumours. Somato-sensory evoked potentials, motor evoked potentials, D wave as well as intraoperative electromyography are the most common tools; which are used depending on the location of the lesion and on pre-operative evaluation.

**Methods:** From April 2008 to March 2023, 60 intra-dural spinal tumours were treated in our unit by the presenting author. All patients had undergone thorough pre-operative as well as post-operative clinical and radiological assessment. Radiological assessment was performed using pre-operative and post-operative MRI with contrast except for one patient who had a cardiac pacemaker. All patients of the present series were discussed with neurophysiologist and operated on using intra-operative neurophysiology monitoring as appropriate depending on the location of the tumour and the availability of the personnel.

**Results:** Majority of patients of the present series had undergone surgery with neurophysiology monitoring. These were used in a different setting depending on the location and extent of the tumour. Intra-operative stimulation of the nerve roots was used as well. Patient outcome and team's confidence significantly improved with the routine use of intra-operative neurophysiology monitoring.

**Conclusions:** The use of appropriate intraoperative neurophysiology technique in selected cases of intradural extramedullary spinal tumours increases safety of surgical excision and surgeons' confidence/ comfort during the surgical procedure. Over the course of this study, progress has been made to manage these patients through minimally invasive approach. Important lessons have been learnt and the presenter would like to share those with the wider neurosurgical community.

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## Oncology

ePoster presentation

### Differential expression of the MRPS18 family genes in medulloblastoma

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**Objectives:** To study an expression pattern of the MRPS18 family genes in medulloblastoma samples; to compare expression pattern at mRNA levels in cancer tissue and in peripheral blood.

**Background:** Medulloblastoma (MB) is one of the most frequent forms of childhood brain tumors. MB is divided into four groups, based on histopathological characteristics and molecular profiles. There is no panel of the significant prognostic markers yet, that will allow to predict the aggressiveness of MB and a course of the disease. Hence, it is important, to perform a search for additional biomarkers with the aim to develop the personalized treatment for MB patients in the future.

**Methods:** Expression patterns of the MRPS18 family genes was studied, using RT-qPCR on the total RNA isolated from surgical tumor samples and peripheral blood of MB patients. Protein signals were detected in tumor tissue sections by immunohistochemistry. A GraphPad Prism software was used for a statistical analysis of the data.

**Results:** The obtained results showed that the genes of the MRPS18 family are differentially expressed in MB samples, compared to the control - conditionally normal brain and peripheral blood. Importantly, the *RB1* gene was not detected either in peripheral blood or in tissue samples of both, the control and MB patients. Noteworthy, the expression patterns of MRPS18 family proteins in tumor tissue, compared to conditionally normal brain tissue, was quite like those, obtained by the RT-qPCR method. Overall, *MRPS18-1* was expressed at approximately equal levels in conditionally normal brain tissue and in MB samples. *MRPS18-3* was observed at a slightly higher level, while *MRPS18-2* was increased dramatically in MB cells compared to conditionally normal tissue.

**Conclusions:** The obtained results demonstrate the differential expression of the MRPS18 family genes in MB. How these proteins are involved in the development of MB and other malignant tumors should be further elucidated.

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## Peripheral

ePoster presentation

Tendons and muscles transfer in patients with peripheral nerve injuries

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**Objectives:** To clarify the effect of these procedure and to highlight the technical tricks in each procedure.

**Background:** Despite the great advances in microsurgical repairs and nerve transfers , there is still a considerable rate of failure especially in common peroneal and high radial nerve injuries . Also some cases of obstetrical palsy after microsurgical repair or patients presented late with limited shoulder abduction and external rotation.

**Methods:** Retrospectively we collected the data of these patients operated in neurosurgery department Mansoura university hospitals for tendon transfer in cases of peripheral nerve injuries and analyzed functional outcome ,complications and compared them to other treatment modalities.

**Results:** 83% of patients showed satisfactory functional recovery after a short period of physiotherapy postoperative. limited postoperative morbidity.

**Conclusions:** Tendon transfer is an effective valid procedure to be considered in management peripheral nerve injuries in properly.



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## Spine

ePoster presentation

Cervical spondylotic myelopathy with focal ossification of the posterior longitudinal ligament (C5-C6) in the young: a case report

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**Objectives:** This is case of a 32-year-old female, who without history of trauma, presented with progressive numbness and weakness of all extremities. Patient has congenital diffused hemangioma. The aim of the paper is to review the association of ossification of the posterior longitudinal ligament (OPLL) and hemangioma as a probable risk factor for developing the disease and treatment response.

**Background:** OPLL is commonly seen among patients in the 60s-70s. Young group (<45 years old) were associated with high BMI, history of trauma and predominance of thoracic OPLL. The OPLL causes compression of the spinal cord causing myelopathy and radiculopathy.

**Methods:** Scan of the upper extremities and whole spine revealed multiple large dilated tortuous veins appear to be draining to dilated hemiazygos and axillary vein. Neck pain was attributed to the nature of her work. However, 2 months prior to surgery the patient had numbness and weakness of her right lower extremity, progressive to include her right upper extremity. Motor examination was 0-1/5 on right lower extremity while 4/5 on the left and 2-3/5 on right upper extremity while 3-4/5 on the left upper extremities. Her hemangioma was distributed along the back, left upper extremity and chest and was enlarges proportional to her growth.

**Results:** Hypertrophic spurs were seen on imaging encroaching the adjacent spinal canal with 80-90% narrowing (Fig 1). MRI revealed severe focal thickening and OPLL involving the C5 to C6-7 level of the cervical spinal canal.

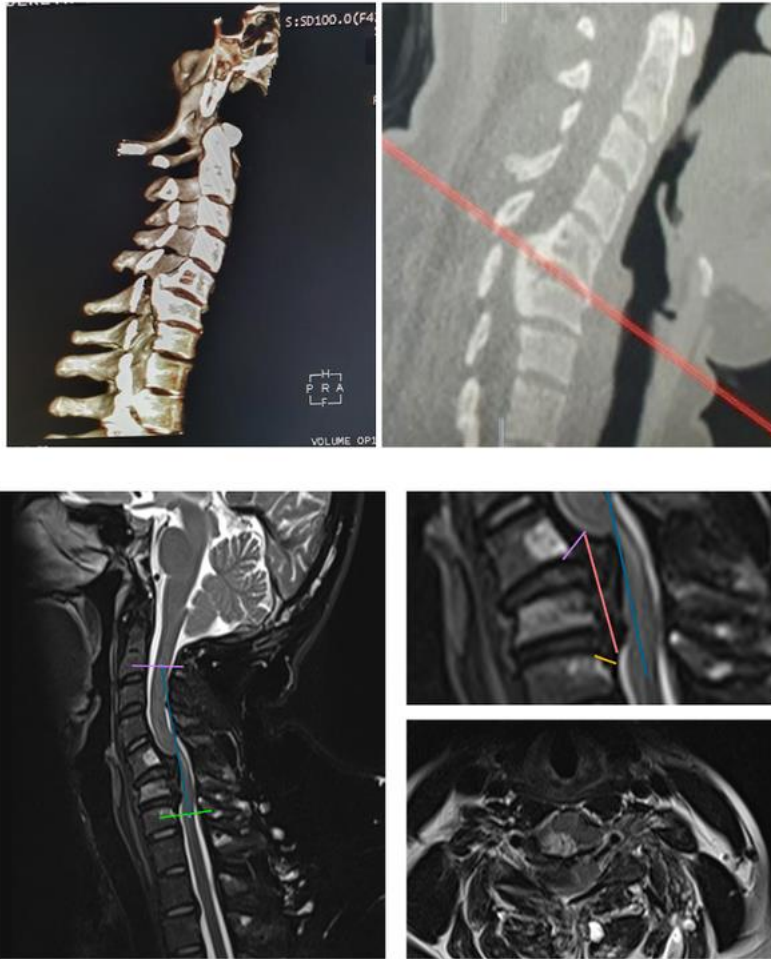


Figure 1. Hypertrophic spurs along

posterior margin of C5 and C6

The patient underwent C6 corpectomy, C5-C7 fusion using titanium mesh cage and autologous bone mixed with bone granules, anterior plate and screws fixation.

**Conclusions:** Follow up at 2 months showed improvement in sensory and motor functions. Complete resolution of symptoms was noted 3 months post-operatively.

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## Skull Base

Oral presentation

Modern technologies in surgical treatment of hyperostotic sphenoidal meningiomas, 10 years of experience

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**Objectives:** To describe modern technologies used in the examination and in the process of surgical treatment of patients with hyperostotic sphenoidal meningiomas.

**Background:** Hyperostotic sphenoidal meningiomas is a complex pathology that requires a multidisciplinary approach. Each step of the surgery has its own challenges: both in the removal of hyperostosis and the soft tissue part of the tumor, and in the reconstruction of soft tissue and bone defects. Modern technologies make it possible to reduce the risks associated with surgical intervention, increase the radicalness of tumor removal, and provide the best functional and cosmetic results.

**Methods:** We analyzed 484 cases of hyperostotic sphenoidal meningioma removal, performed from 2017 to 2022 at the Burdenko Neurosurgical Center. The application of modern technologies on the result of surgical treatment was assessed.

**Results:** We used CT or ASL perfusion in 46 patients. Combination of CT and MRI was performed in 30 patients with signs of optic nerve compression. Neuroimaging data, combined with perimetry results, were used to plan the direction and extent of optic nerve decompression. Optical navigation was used to determine the boundaries of the planned volume of tumor resection in 59 cases. 5-ALA diagnostics is a technology of limited application in this group of patients that solves specific problems. Endoscopic assistance was used in 7 patients, endoscopic interventions as an independent method - in 3 patients. 3D modeling at the stages of preparation for surgery was used in 56 patients, 24 patients received individual 3D printed implants. The influence of the techniques on the frequency of complications, radicality of the surgery, functional and cosmetic outcomes was studied.

**Conclusions:** Modern technologies make it possible to reduce the risks associated with surgical intervention, increase the radicalness of tumor removal, and provide the best functional and cosmetic results.

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## Oncology

ePoster presentation

### Primary Intramedullary Pilomyxoid Astrocytoma of Spinal Cord (PIPASC): a systematic review of case reports of two decades

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**Objectives:** To evaluate the clinical manifestations, histopathologic spectrum and onco-surgical management of this neoplasm.

**Background:** Pilomyxoid Astrocytoma is a new variant of pilocytic astrocytoma. It is more aggressive and relatively rare, mostly seen in children and commonly found in brain. Spinal PMA is extremely rare. The distinct aggressive and pathological behavior, poor prognosis and the diversity in response to various treatment modalities makes the spinal PMA an oncologic enigma.

**Methods:** After an extensive literature search using PubMed Central, Google Scholar and Scopus, eight case reports and one case series of patients with spinal PA were retrieved and included using the Preferred Reporting Items for Systematic review and Meta-analyses (PRISMA) guidelines without applying any filter of time, study type or place. Case presentations of 12 patients were analyzed in this review.

**Results:** Paediatric preponderance of the neoplasm (75%) with the mean age of  $7.90 \pm 4.51$  years was noted. Sensory neurological deficits were the most common presenting complaint in 83.33% of patients, while scoliotic deformity being the commonest sign in 33.33% cases. Thoracic spine (50%) was most commonly affected region. MRI showed the most consistent findings of cord compression in 100% cases and the lesion appeared hypointense on T1-weighted images (T1WI) and hyperintense on T2-weighted images (33.33%). Partial resection was the most common extent of resection in 50% lesions. Immunohistochemistry manifested GFAP positivity in 66.67%, S-100 and synaptophysin in 16.67% of the cases respectively. Most common post-operative complication was gait disturbances (33.33%). The average post-treatment survival duration was found to be more than 2 years.

**Conclusions:** Occurrence of spinal PMA among paediatric population is rare. They have the possibility of extraneural metastasis, can differentiate into more malignant glioma and get recurrent due to which they require a long-term follow-up of the patients. Further studies are required to investigate the utility of chemotherapy and radiotherapy in its management.

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## Spine

ePoster presentation

### Role of MRI in predicting outcome in cervical spondylotic myelopathy

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**Objectives:** The objective of this study is correlate the DTI and contrast MRI findings with the severity and functional outcome of the patients with CSM following surgical decompression.

**Background:** Cervical spondylotic myelopathy (CSM) is the compression of cervical spinal cord due to narrowing of the vertebral canal foramen. DTI and contrast MRI done preoperatively can help predict the outcome in CSM.

**Methods:** We conducted a prospective observational study. Patients with CSM admitted for cervical decompression were included in the study. DTI and T1 post-contrast images were acquired along with the routine MRI sequences. FA value and ADC value were calculated on DTI images at the level of maximal cord compression. The severity of the CSM was determined by mJOA Score, NDI score, VAS score and AIIMS Myelopathy Score (AMS). The patients were followed up at 3 months, 6 months and 1 year after the surgery.

**Results:** A total of 28 patients with CSM were included in the study. Among them, 26 (92.9%) were male and 2 (7.1%) were female. Severe myelopathy was determined by FA value  $<0.361$  and ADC value  $\geq 9.175 \times 10^{-10} \text{ m}^2/\text{s}$  based on mJOA score. The FA and ADC values correlated with mJOA score at all time periods (preoperative and postoperative) with a p value less than 0.05. The FA value and ADC value correlated with AMS score at all time periods. However, there was no correlation between the FA value and ADC value with the VAS score.

**Conclusions:** There is a significant role of MRI in predicting the outcome in patients with cervical spondylotic myelopathy. However, further studies with longer follow up and a greater number of patients are required to get conclusive results.

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## Neurovascular Surgery

ePoster presentation

### No link between enteral volume loss and inflammatory processes in aneurysmal Subarachnoid Haemorrhage patients

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**Objectives:** To determine if there is a link between increased enteral volume loss and inflammatory processes in aneurysmal subarachnoid haemorrhage (aSAH).

**Background:** In a previous study, we noted that patients with aneurysmal subarachnoid haemorrhage (aSAH) who subsequently develop diarrhoea have a significantly increased odds of developing DIND<sup>1</sup>; all of these patients had been prescribed osmotic laxatives. It was speculated that this might be due to inflammatory processes secondary to the aneurysm rupture<sup>2</sup>. It has been confirmed that there is an association between inflammatory neutrophil-to-lymphocyte ratio (NLR) at day 2 onward as a predictor of DIND<sup>3</sup>. Takotsubo cardiomyopathy is thought to be caused by catecholamine release as part of the inflammatory stress response of aSAH<sup>4</sup>. Here we investigate if there is a link between those patients with increased enteral volume loss and aSAH inflammatory processes (raised NLR ratio and Takotsubo cardiomyopathy).

**Methods:** A prospective study was performed for all adult patients (aged > 16 years) admitted to the Department of Neurosurgery at Leeds General Infirmary with a diagnosis of aSAH between 2022 and 2023. Statistical significance was set for  $p < 0.05$ .

**Results:** 127 patients data was analysed: 63 received did not receive osmotic laxatives (group A) and 64 received osmotic laxatives (group B). There was no baseline difference in age, sex and clinical status (WFNS and Fisher scores). No statistically significant difference was seen in incidence of Takotsubo cardiomyopathy or day 2 NLR in those with and without diarrhoea or with and without DIND regardless of whether they received osmotic laxatives.

**Conclusions:** With no difference in inflammatory processes in those with or without diarrhoea and with and without DIND, it is unlikely that unaccounted for enteral volume loss after aSAH is due to generalised inflammatory processes. It is likely that osmotic laxative and volume depletion is responsible for the increased incidence of DIND in patients with diarrhoea following aSAH.

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## Spine

Oral presentation

### The significance of the postoperative syrinx

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**Objectives:** To conduct a retrospective study of patients who underwent surgery for syringomyelia associated with Chiari malformation at a major neurosurgical centre.

**Background:** Syringomyelia is a disorder of the spinal cord characterised by the presence of fluid-filled cavities. Its prevalence is 8.4 per 100,000 population and is often associated with Chiari malformation. The response of the syrinx to surgery is variable and may continue to decrease for months and even years after craniovertebral decompression.

**Methods:** This was a retrospective study over 30 years performed at a major neurosurgical centre in Jamaica. Patients who had surgery for syringomyelia were identified using the main operating theatre database. This was cross-referenced with medical records and demographics, clinical features, location and extent of the syrinx, and the surgical outcomes were documented. Both clinical and radiological outcomes were analysed.

**Results:** Of the 36 cases identified, 79% (28) were female. Most (94%) had a diagnosis of Chiari I with a syrinx. The remainder were associated with a Chiari II malformation. Most patients presented with motor signs (61%) and limb paraesthesia (50%). The extent of the syrinx was cervicothoracic on most scans (55%). Patients underwent craniovertebral decompression and expansion duraplasty. The duraplasty was performed with pericranium, fascia lata or dural substitute, with or without biological glue. Complications included open cerebrospinal fluid leak (11%) and pseudomeningocele (5%). Of the patients with documentation of follow-up available, 82% (14) had clinical improvement, 12% remained the same, and 6% worsened. On the last postoperative MRI available, 15% had complete syrinx resolution, and 70% showed improvement. There was no evidence of change in the size or extent of the syrinx in 15%.

**Conclusions:** There was an improvement in motor and cerebellar signs and urinary dysfunction after craniovertebral decompression. Clinical improvement correlated with a decrease or the resolution of the syrinx on postoperative imaging.

## Trauma

Oral presentation

Effect of dexmedetomidine hydrochloride (Percedex®) on functional outcome of patients with moderate and severe traumatic brain injury

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**Objectives:** To determine the effects of dexmedetomidine hydrochloride (Percedex®, DEX) on functional outcome of patients with moderate and severe traumatic brain injury (TBI).

**Background:** Traumatic brain injury (TBI) is considered among the leading causes of morbidity and mortality worldwide being associated with significant social and economic burden. The best sedative regimen in TBI patients is yet to be identified.

**Methods:** This was a retrospective cohort study including patients with severe (3-8) and moderate (9-13) TBI referring to a level I trauma center. We studied two groups of patients, those receiving DEX or routine sedation regimen in neurointensive care unit (NICU). The main outcome measures were the Glasgow outcome scale extended (GOSE) at 3 and 6-month. We have also recorded ICU and hospital length of stay (LOS) and the tracheostomy rate. We included 138 patients in two study groups (each including 69).

**Results:** The baseline characteristics were comparable between groups. DEX was associated with lower LOS in hospital ( $p=0.002$ ) and NICU ( $p=0.003$ ). The GOSE was comparable between two study groups at 3 ( $p=0.245$ ) and 6-month ( $p=0.497$ ). Multivariate regression analysis revealed that after LOS of NICU and hospital stay adjustment, DEX group experienced significantly improved 6-month GOSE with the average improvement in score of 0.92 compared to the control group ( $p=0.041$ ).



**Table** Functional outcome of 138 patients with moderate and severe traumatic brain injury included in the current clinical trial.

	DEX (n=69)	Control (n=69)	p-value
<b>GOSE</b>			
3-month	4.89 ± 2.51	4.32 ± 1.62	0.245
6-month	6.07 ± 2.40	5.75 ± 3.06	0.497
<b>GOSE at 3 months</b>			
Dead (%)	3 (4.3%)	4 (5.8%)	0.078
Vegetative state (%)	9 (13.1%)	12 (17.4%)	
Lower severe disability (%)	10 (14.5%)	15 (21.7%)	
Upper severe disability (%)	11 (15.9%)	10 (14.5%)	
Lower moderate disability (%)	8 (11.6%)	8 (11.6%)	
Upper moderate disability (%)	9 (13.1%)	5 (7.3%)	
Lower good recovery (%)	4 (5.8%)	3 (4.3%)	
Upper good recovery (%)	15 (21.7%)	12 (17.4%)	
<b>GOSE at 6 months</b>			
Dead (%)	9 (13.1%)	8 (11.6%)	0.394
Vegetative state (%)	3 (4.3%)	2 (2.9%)	
Lower severe disability (%)	2 (2.9%)	2 (2.9%)	
Upper severe disability (%)	0 (0.0%)	4 (5.8%)	
Lower moderate disability (%)	4 (5.8%)	5 (7.2%)	
Upper moderate disability (%)	5 (7.3%)	1 (1.4%)	
Lower good recovery (%)	4 (5.8%)	22 (31.9%)	
Upper good recovery (%)	42 (66.6%)	25 (36.3%)	
<b>Prognosis</b>			
Favorable (%)	46 (66.6%)	47 (68.2%)	0.923
Unfavorable (%)	23 (33.4%)	22 (31.8%)	
<b>Admission duration</b>			
ICU (days)	15.10 ± 9.8	22.9 ± 15.4	<b>0.003</b>
Hospital (days)	23.7 ± 20.1	35.2 ± 23.1	<b>0.002</b>
<b>Tracheostomy</b>			
Yes (%)	30 (43.5%)	36 (52.2%)	0.394
No (%)	39 (56.5%)	33 (47.8%)	
<b>Side effects</b>			
Hypotension (%)	27 (39.1%)	8 (11.6%)	<b>&lt;0.001</b>
Bradycardia (%)	18 (26.1%)	3 (4.3%)	<b>&lt;0.001</b>
Aspiration pneumonia (%)	25 (36.3%)	21 (30.4%)	0.094

**GOSE:** Glasgow Outcome Scale Extended; **ICU:** Intensive care unit

**Conclusions:** The results of the current study revealed that administration of DEX in patients with severe and moderate TBI was associated with decreased ICU and hospital LOS and improved functional outcome (GOSE) at 6-month period after adjusting for confounders. The need for tracheostomy tube insertion was not affected by the DEX administration. Thus, we recommend administration of DEX for treatment of the patients with moderate and severe TBI based on its safety and efficacy in improving the functional outcome and reducing the hospital LOS.

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## Paediatric

Oral presentation

Children with diastematomyelia have good postoperative quality of life: results from an Asian country

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**Objectives:** To evaluate the quality of life at follow-up in patients surgically treated for diastematomyelia.

**Background:** Diastematomyelia can be associated with neurological deficits and disability. Surgical treatment is aimed at de-tethering the spinal cord and reducing any mass effect. Quality of life can be significantly affected in these children, but limited evidence is available.

**Methods:** This was a retrospective cohort study. We reviewed the records of patients with the diagnosis of diastematomyelia who were operated between 1<sup>st</sup> July' 2012 and 31<sup>st</sup> July' 2022. Data was collected by reviewing the medical records of patients and the Health Utility Index-3 (HUI-3) scoring was completed by the guardian/family member to rate their quality of life. Clinical and neurological outcomes were also analyzed.

**Results:** The median age of patients at time of presentation was 7 (IQR: 1.4 – 11.5) years. Females were nearly twice in numbers than males (17; 68%). Nineteen patients (76%) had a normal motor neurological function at presentation (Modified McCormick grade I). The most common anatomic level of diastematomyelia was lumbar (12 48%) followed by lumbosacral (5, 20%). Bony spur arising from the lamina was the most common reason for splitting the cord (16; 64%). The neurological status over time improved or remained static in 21 patients (84%) while 1 patient was observed to have worsening of neurological status over time (4%). The median follow-up time postoperatively was 3.3 years (IQR: 2 – 6). The mean HUI3 score (out of 1) for 21 children was  $0.93 \pm 0.24$ .

**Conclusions:** Our results suggest that surgical management of diastematomyelia is beneficial in terms of neurological outcomes and is associated with good long term quality of life.

## Paediatric

ePoster presentation

Clinical significance of cavum septum pellucidum and cavum vergae and neurosurgical implications in children: a single tertiary centre experience

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**Objectives:** - Investigate demographics, comorbidity, neurological symptom, and surgical management in a large paediatric case series of CSP and CV

- Explore association between co-morbidities and symptoms with cyst size and presence of CV
- Determine if surgical management is indicated in children with CSP and CV

**Background:** Cavum Septum Pellucidum (CSP) is a cavity between the two lateral ventricles filled with CSF and Cavum Vergae (CV) is known to be its posterior extension. Presence of CSP and CV seems to be a normal variation; however, association with psychiatric disorders, chronic head trauma, and developmental disorders have been reported. Although general consensus for the indication of neurosurgical management of CSP is large or symptomatic cysts, evidence is scarce for the paediatric population.

**Methods:** We retrospectively reviewed patients from age 0-16 who had CSP findings from February 2011 to March 2022 at the Royal Hospital of Sick Children in Edinburgh. Demographics (age at diagnosis, sex, race), neurological symptoms, relevant co-morbidities, and surgical treatments were extracted. Cyst length was drawn from MRI and CT; a corrected measure was calculated by dividing by septum pellucidum length, accounting for age differences. Multiple linear and logistic regression models correcting for sex were constructed investigating association between corrected size and presence of CSP, with presence of neurological symptoms and relevant co-morbidities. Surgical indication and outcomes were also explored.

**Results:** A total of 283 patients were included. Only intracranial haemorrhage was significantly associated with CSP length; there was no association between any neurological symptom and CSP size (Table 1). Presence of CV was not associated with neurological symptoms.

		n (%)	P (>0.05 significant)
<b>Co-morbidities</b>	Head injuries	15 (5.30%)	0.288
	Hydrocephalus	38 (13.42%)	0.485
	Tumour	14 (4.95%)	0.204
	Cerebral Palsy	27 (9.54%)	0.792
	Developmental disorders	98 (34.63%)	0.908
	Intracranial haemorrhage	40 (14.13%)	0.006
	Epilepsy	36 (12.72%)	0.103
	Psychiatric disorders	18 (6.36%)	0.773
	Pre/peri natal history	40 (14.13%)	0.625
<b>Symptoms</b>	Headache	39 (13.78%)	0.275
	Seizure	54 (19.08%)	0.880
	Papilledema	5 (1.76%)	0.370
	Ataxia	7 (2.47%)	0.896
	Emesis	23 (8.13%)	0.058
	Syncope	2 (0.71%)	0.924
	Visual symptoms	30 (10.60%)	0.733
	Sensory symptoms	9 (3.18%)	0.344
	Motor symptoms	55 (19.44%)	0.649
	Memory	5 (1.76%)	0.135
	Total	N = 283	

**Conclusions:** There was no difference in size of CSP, or presence of CV in children with other co-morbidities or neurological symptoms. Size of CSP and presence of CV did not impact neurosurgical management.

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## Trauma

ePoster presentation

Use of a bone tissue equivalent with mesenchymal stem cells for bone repair of craniectomies in a murine model

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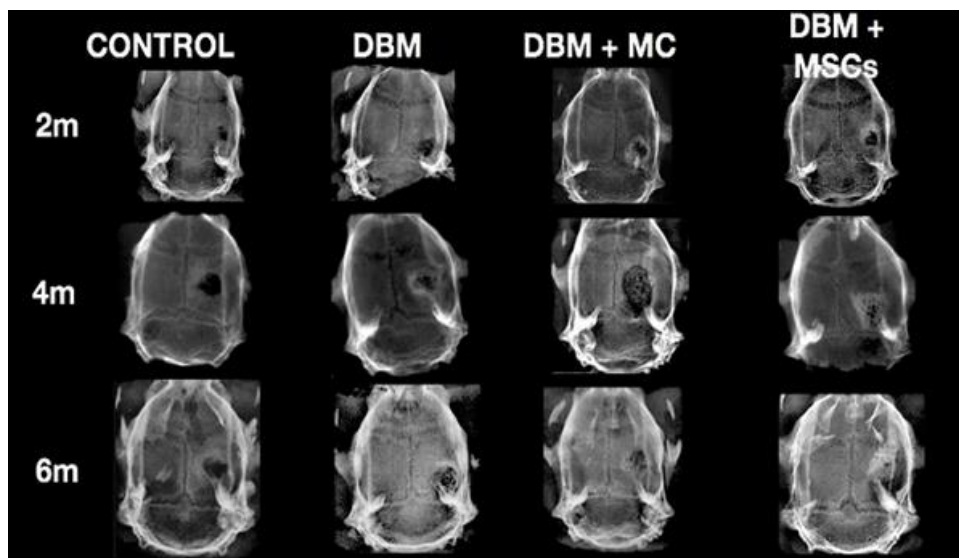
**Objectives:** To evaluate the rate of repair in a murine model of craniectomies to which a demineralized bone matrix graft was applied in combination with mesenchymal stem cells.

**Background:** After a craniectomy, the repair of the cranial defect by means of a cranioplasty has the following

**Objectives:** to protect the brain tissue, avoid trephination syndrome, and improve the aesthetics and psychological well-being of the patient.

**Methods:** 48 male rats of the Wistar strain of 120g were used. Experimental animals were randomly divided into the following experimental groups: Control (covered with spongostan hemostatic), DBM (devitalized bone matrix), and demineralized bone matrix graft was applied in combination with mesenchymal stem cells (DBM-MSc). A 7mm diameter craniectomy was performed. After 2, 4, and 6 months, the specimens were analyzed by RX. The GraphPad Prism 8 software was obtained for the statistical analysis, and a 2-way ANOVA and Sirak's multiple comparison test were used.

**Results:** The morphometric analysis reveals an ossification at 6 months of 8% in the control group, that of DBM 90%, and the equivalent made up of DBM+MSc the repair was 82% at two months reaching 94 percent at 6 months.



**Conclusions:** The tissue equivalent made up of the DBM seeded with the MSCs promotes greater repair in less time.

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## Oncology

ePoster presentation

### Intraventricular trigonal meningiomas – institutional experience

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**Objectives:** Ventricular meningiomas are extremely rare entity and represent 1-2% of all meningiomas. Authors present their experience with trigonal meningiomas.

**Background:** .

**Methods:** Ten patients were operated on in the period 2004-2022 in our institution. Nine women and one man. Average age was 46.7 year (28-71).

**MRI:** Average volume of tumour was 29 ml (2.5-63). Oedema was present in 5 patients. Hydrocephalus was present in three patients. Midline shift was recorded in 5 patients – 7 - 12 mm.

**Clinical findings:** incidental in 2 patients, nausea, vomiting in 5 patients, coma in two patients, homonymous hemianopsia in 6 patients (in two comatous impossible to examine) and finally hemiparesis in 5 patients. Transtemporal approach was used in the beginning period and in one case where optic radiation was destroyed before surgery. In all other patients parietal (parietooccipital) approach has been used.

**Results:** Emergent surgery in comatous patients was used in two cases. EVD was first choice, followed by tumour extirpation in 24 hours. One of these patients had recurrent intraventricular hematoma with evacuation which resulted in long-term severe disability. All other patients had good outcome. No new homonymous hemianopsia (HH) has been recorded, and initial HH improved in 5 patients with exception of one patient where optic radiation was destroyed before surgery. Surgery was radical in 8 patients, in one case small residuum was irradiated using Leksell gamma knife (no growth in 10 years) and in one case extremely small suspicious residuum is followed by PET MRI.

**Conclusions:** Surgery of trigonal meningiomas is very effective with good long term results. Acute surgery is sometimes in large tumours with brain shift, oedema and hydrocephalus necessary.

## Trauma

Oral presentation

An analysis of cranioplasty complications according to timing of surgery, implants' material and incidence of post-traumatic hydrocephalus

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**Objectives:** To explore the correlation between timing of surgery, implants' material and incidence of postoperative complications in patients undergoing cranioplasty surgery.

**Background:** Despite the increasing number of decompressive craniectomy (DC) in neurotrauma, the best timing for elective cranioplasty is still debated. Little is known about the systematic recording of cranioplasty complications according to timing of surgery, material used and presence of post-traumatic hydrocephalus.

**Methods:** A prospective multicenter observational study was carried out from January 2010 to December 2021 in 8 European neurosurgical centers. A cohort of over 4007 patients undergoing cranioplasty following DC for severe head injury was studied. The timing of cranioplasty was classified as follow: Group 1 "ultra-early" (<30 days), Group 2 "early" (between 31 and 90 days), Group 3 "late" (> 90 days). A complication was defined, as per Clavien-Dindo classification, as any deviation from standard postoperative course requiring revision surgery and/or a new hospital admission.

**Results:** Our database included 352 patients (8.8%) who underwent an ultra-early cranioplasty, whereas 1627 (40.5%) and 2028 (51.7%) underwent early and late cranioplasty, respectively. Overall complication rate was 34% (1360/4007 patients) subdivided as follow: 23% infection, 21% internal hydrocephalus, 16% external hydrocephalus, 15% epilepsy, 11% postoperative acute subdural hematoma, 8% extradural hematoma, 6% subdural hygroma. Cranioplasty surgery stabilised a ventriculomegaly or a subacute or chronic post-traumatic hydrocephalus in 80% of cases, whereas 17% of patients needed a Ventriculo-Peritoneal (VP) shunt during follow-up. Simultaneous cranioplasty and VP shunt resulted in surgical site infection in all cases, regardless of the cranioplasty material used. Sinking Skin Flap Syndrome (SSFS) occurred in 9% of cases, with a significantly higher risk ( $p < 0,05$ ) in group 3. Hydrocephalus and epilepsy were significantly lower ( $p < 0,05$ ) in Groups 1 and 2.

**Conclusions:** This study demonstrates that types, rate and severity of complications after elective cranioplasty are influenced by timing of surgery more than implants' material.

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## Spine

ePoster presentation

Comparative analysis of surgical complications in patients who had laminotomy or laminectomy for expansive processes of the spine

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**Objectives:** Our main goal is to present common postoperative complications in our patients undergoing laminectomies or laminotomies. We evaluate the frequency of these postoperative complications in a case series of 64 patients who had either a laminectomy or a laminotomy.

**Background:** Laminectomy is the most common surgical approach to relieve spinal cord compression caused by a solid tumor. Laminectomy involves removal of the bony arch, or lamina, of a vertebra. This is often combined with biopsy and/or debulking of the tumor. Laminotomy is defined as an en-bloc surgical division of the vertebral arch at the base of the laminae with subsequent re-positioning at the end of the procedure. The advantage of laminectomy is the rapid decompression of the spinal cord, also the procurement of tumor tissue for proper histologic diagnosis and is accepted as the most likely modality to stabilize or improve lost neurologic function.

**Methods:** Sixty-four patients were selected for the study, 55 of which underwent laminectomy and 9 patients that underwent laminotomy. All of them were evaluated for postoperative complications.

**Results:** Of the 64 patients evaluated, 55 underwent laminectomy and 9 underwent laminotomy. A total of 3/64 (4.6875%) patients have developed an infection, of which 2 (3.64%) patients treated with a laminectomy and 1 (11.12%) with laminotomy, 1/64 patient had liquorrhea (%), 1/64 (1.5625%) patient developed a fistula, 1/64 (1.5625%) patient had a hematoma and 1/64 (1.5625%) patient had migration of the bone flap.

**Conclusions:** Statistically significant differences were demonstrated between laminectomy and laminotomy for complication outcomes in our clinic. In our case study the laminotomy has been proved to have much less postoperative complications. But, in spite of that the laminectomy remains to be used as surgical treatment.



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## Global Neurosurgery

Oral presentation

Establishing a global neurosurgical unit in Northern Tanzania through local-global partnership between Kilimanjaro Christian Medical Center and Barrow Neurological Institute

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**Objectives:** 1. Create a global neurosurgical unit to serve the population in Northern Tanzania with 15 million people catchment.

2. Evolve the unit into a regional neurosurgical referral center with international collaboration.

**Background:** Tanzania healthcare provision and training is severely limited by a shortage of specialists, including only 22 neurosurgeons covering the entire nation of nearly 62 million. We proposed developing a global neurosurgical unit to address both local care shortages as well as regional training deficits for neurosurgical specialization.

**Methods:** A neurosurgery unit was established in 2022 at Kilimanjaro Christian Medical Center (KCMC) under the leadership of Dr. Happiness Rabiél, a COSECSA neurosurgery fellow, with general surgery resident staffing. The global neurosurgical collaboration was initiated one year following the unit inauguration with permanent on-site support by a senior and junior neurosurgery consultant from Barrow Neurological Institute (BNI).

**Results:** After creation of the unit, the team performed a total of 398 cranial and spinal operations in 15 months, of which 190 were deemed emergent cases and 180 were elective. The most common indications included cranial trauma (n=138, or 34.7%) and hydrocephalus (n=100, or 25.1%).

Initiation of permanent on-site staffing with collaborative neurosurgeons from BNI began in May 2023, with 16 joint cases to date. The collaboration includes joint clinical unit management, bidirectional education, and bidirectional resource and technology sharing, with stepwise expansion to multilateral training collaboration across sub-Saharan Africa planned.

**Conclusions:** We present the development of the first global neurosurgical unit in Northern Tanzania with KCMC neurosurgical leadership and collaborative permanent on-site BNI support. Our goal is to create a shared center of excellence in neurosurgical care and training outside of high-resource settings to improve the local population access to high-quality specialty care and regional access to high-quality training in a sustainable and stepwise manner.

## Hydrocephalus

Oral presentation

Incidence and outcomes of ventriculoperitoneal shunt-treated chronic secondary hydrocephalus at a tertiary UK neurosurgical centre: a 4-year retrospective observational study

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### Objectives:

1. To determine incidence and aetiology of chronic secondary hydrocephalus at a UK centre.
2. To outline complications arising from VP shunt insertion in this population.

**Background:** Chronic secondary hydrocephalus is a novel diagnosis adopted by the Hydrocephalus Society, described as any CSF accumulation due to a concurrent central nervous system pathology for over 3 months. Causes include subarachnoid haemorrhage, tumour or trauma. There is little evidence on the incidence and outcomes from this condition.

**Methods:** We conducted a single-centre retrospective cohort study on all patients undergoing a VP shunt insertion at the Queen Elizabeth Hospital, Birmingham between 18/03/2019 and 18/03/2023. All patients with chronic secondary hydrocephalus were included, whilst all other forms of hydrocephalus (e.g. IHH) were excluded. Using our electronic health record, we collected data on patient demographics, indication, duration of symptoms, 30-day complications and patient survival to the present day, excluding duplicates.

**Results:** Overall, 386 patients underwent 422 VP shunt procedures during the study period. 42 patients with chronic secondary hydrocephalus (10.9%) underwent 47 VP shunt insertions. Within this group, 31 (73.8%) were female with a mean age of 46.2 years. The most common aetiology was tumour (26 patients). Complications were observed following 10 procedures (21.2%), with 8 revisions required. 6 were due to disconnection/fracture of the shunt apparatus in 4 patients, which all occurred within 30 days of the shunt insertion and required revision of the VP shunt. There were no deaths in any of the patients.

**Conclusions:** In this 4-year follow up study of operated chronic secondary hydrocephalus patients at our centre, we report an incidence of 10.9%, a female sex and tumour aetiology preponderance. Our complication and revision rates were comparable to the literature. In future studies, we aim to provide longer-term follow up data to inform the incidence and outcomes in this cohort of patients.

## Neurovascular Surgery

ePoster presentation

An 89-year old Filipino female with ruptured middle cerebral artery aneurysm within a supratentorial ependymoma: a case report and literature review

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**Objectives:** The authors aim to present a case of a ruptured middle cerebral artery aneurysm and supratentorial ependymoma in a Filipino elderly. A literature review was conducted to further characterize the association of aneurysm and gliomas as these cases are rare, especially of supratentorial ependymoma.

**Background:** Intracranial aneurysm within a brain tumor is unusual. Moreso, if this aneurysm ruptures, causing catastrophic effects and complications during planning and treatment. To the authors' knowledge this is the first such case in the Philippines.

**Methods:** The authors describe a case of an elderly who presented with decreased sensorium. Initial impression was acute intracerebral hemorrhage from coagulopathy versus a ruptured aneurysm at the right middle cerebral.

**Results:** An enhancing tumor was also appreciated encasing the aneurysm. She also had multiple skin lesions with areas of hemorrhage on the superomedial orbit near the eyebrow and right frontal area, for which excision was done showing basal cell carcinoma, adenoid type. Patient successfully underwent cerebral catheter angiography, coil embolization of the right distal M1 ruptured aneurysm followed by right frontotemporal craniotomy, excision biopsy of tumor, and evacuation of hematoma. Histopathology and immunohistochemical studies confirmed the diagnosis of supratentorial ependymoma.

**Conclusions:** There is still insufficient data regarding development of intracranial aneurysm within brain tumors specifically gliomas, however, several theories have been presented to elucidate their causality. This case illustrates the coexistence of an ipsilateral ruptured M1 aneurysm within supratentorial ependymoma in the elderly. One should be cognizant of these possibilities to reduce surgical risks and complications.

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## Oncology

Oral presentation

### Awake craniotomy for intra-axial brain tumors does not affect size of residual disease: a systematic review and meta-analysis

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**Objectives:** To compare onco-functional and surgical outcomes between AC and GA for intra-axial brain tumors.

**Background:** Awake craniotomy (AC) for intra-axial brain tumors is useful for preserving cortical and subcortical white matter tracts that may have tumor invasion. No specific guideline or concrete evidence exists regarding the superiority of AC over surgery under general anesthesia (GA), with many surgeons preferring resection under GA for benefits of potentially better extent of resection.

**Methods:** A systematic review and meta-analysis was conducted in accordance with PRISMA guidelines and registered on PROSPERO(CRD42022311131). A comprehensive search was conducted using specific keywords and MeSH terms with Boolean operators, from PubMed and Cochrane databases. Pooled effect size was estimated using a Mantel-Haenszel random-effects model, with evaluation of heterogeneity using Higgins  $I^2$  statistic.

**Results:** Of 929 articles, ten were included for quantitative analysis. Selected studies included 1974 patients (681 in the AC group, 1293 in the GA group). No significant differences were seen between GA and AC groups in terms of extent of resection (MD: 3.77,  $p=0.38$ ,  $I^2=91\%$ ), rates of gross total resection (OR: 1.20,  $p=0.69$ ,  $I^2=74\%$ ), OR time (MD: 5.96,  $p=0.15$ ,  $I^2=0\%$ ), or length of stay (MD: -3.39,  $p=0.21$ ,  $I^2=92\%$ ).

**Conclusions:** AC is not inferior to surgery under GA for extent of resection of intra-axial brain tumors, with comparable rates of GTR and EOR. While non-significant, current data trends towards shorter operating time and length of stay as well for AC group patients. Though we could not perform quantitative comparison of neurological outcomes due to non-availability of comparative data, the available evidence did not support one technique over the other.

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## Spine

ePoster presentation

Cervicomedullary arteriovenous fistula presenting as subarachnoid hemorrhage in a 46-year old female: a case report and literature review

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**Objectives:** The authors aim to describe a case of cervicomedullary arteriovenous fistula which was successfully treated using stereotactic radiosurgery.

**Background:** Spinal arteriovenous malformation is an uncommon entity. It is usually treated through microsurgical intervention and endovascular embolization. However, some cases are deemed complicated to undergo such interventions.

**Methods:** The authors describe a case of a middle-aged Filipino female who presented with sudden onset nape pain associated with elevated blood pressure.

**Results:** Initial impression was diffuse subarachnoid hemorrhage secondary to a ruptured left vertebral aneurysm versus left dural AV fistula. On cerebral catheter angiography, a spinal dural arteriovenous fistula is noted at the V3-V4 segment junction of the left vertebral artery. All interventions were considered during the multidisciplinary discussion. The patient successfully underwent fractionated stereotactic radiotherapy. On follow up after 6 months, cranial and cervical MRI was done which showed regression of the cervicomedullary AV fistula. Resolution of symptoms was appreciated thereafter.

**Conclusions:** Stereotactic radiosurgery can be offered to patients who are not candidates for microsurgical or endovascular ablation of spinal AV fistulas. It offers painless and noninvasive treatment with excellent clinical and radiologic outcomes.

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## Neurovascular Surgery

Oral presentation

Intraoperative flowmetry in asymptomatic middle cerebral aneurysm surgery – prospective study

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**Objectives:** Low perioperative morbidity/mortality in elective middle cerebral artery aneurysms is an imperative. Multimodal intraoperative monitoring should be anticipated contribution to detection of potential complications.

**Background:** Authors present group of patients where intraoperative flowmetry (TTFM) was used and compare this group with retrospective group of patients without flowmetry.

**Methods:** Group 1 (prospectively monitored patients with the use of TTFM): 40 patients, 24 women, 16 men, average age 55,7 yea. Location of aneurysm: M1-1, M1/2 36, M2/3 4. Aneurysm size: small 27, middle 10, large 3. Group 2 (retrospective, without TTFM): 20 patients, men 4, women 16. Location M1/2 18, M2/3 2 patients. Aneurysm size: small 15, middle 5.

Groups were homogenous in all parameters with exception of gender.

Monitoring was performed using flowmeter Transonic inc in ml/min with print recording. Another part of multimodal monitoring were MEP and ICG. Results were evaluated by modified Rankin scale (mRS).

**Results:** mRS results did not differ in both groups after 30 and 90 days.

But in two cases decrease of flow forced surgeon to change clip position (with flow restoration). This maneuver certainly prevented territorial ischaemia.

In two patients TTFM was not performed because of anatomical difficulties.

In one case multimodal monitoring did not predicted postoperative neurological deficit which resulted from embolisation to speech area.

**Conclusions:** TTFM represents important modality in safety improvement of brain aneurysm surgery. TTFM limits are topic of discussion.

## Neurovascular Surgery

Oral presentation

DIND incidence in patients with aSAH and enteral volume loss with and without osmotic laxatives

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**Objectives:** To compare the incidence of delayed ischaemic neurological deficit (DIND) in patients with aneurysmal subarachnoid haemorrhage (aSAH) and enteral volume loss with and without the use of osmotic laxatives.

**Background:** DIND is a clinical manifestation of cerebral vasospasm, which can lead to significant morbidity and mortality following aSAH. In a previous study, we noted that aSAH patients who develop diarrhoea had an increased odds of developing DIND<sup>1</sup>, with osmotic laxatives commenced upon admission. Our medication protocol has since been amended, excluding osmotic laxatives.

**Methods:** A prospective study was performed for all adult patients (aged > 16 years) admitted at our institution with a diagnosis of aSAH between 2022 and 2023. Data was compared to the published cohort. Statistical significance was set for  $p < 0.05$ .

**Results:** Data from 127 patients was analysed: 63 did not receive osmotic laxatives (group A) and 64 received osmotic laxatives once other laxatives failed (group B). Our previous cohort (n=105) received osmotic laxatives on admission (Group C).

There was no baseline difference in age, sex, and clinical status (WFNS and Fisher scores) between all groups. The incidence of DIND was 7.9% (n=5) and 28.1% (n=18) in group A and B, respectively ( $p=0.003$ ), compared to 14.3% (n=15) in group C. Of these, 3 (4.8%) patients in group A and 7 (10.9%) in group B had diarrhoea. On the new protocol, patients had increased odds of developing DIND if they had received osmotic laxatives (OR 4.53, CI 1.57-13.15,  $p=0.005$ ) or had osmotic laxatives and developed diarrhoea (OR 7.2, CI 1.52-34.25,  $p < 0.001$ ). On the old protocol, patients who received laxatives on admission and developed diarrhoea (Group C) had increased odds of developing DIND (CI 0.99-14.79,  $p=0.053$ ).

**Conclusions:** Osmotic laxatives are significantly associated with increased incidence of DIND in patients with aSAH. A non-osmotic laxative medication protocol for aSAH patients decreases the likelihood of developing DIND.

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## Global Neurosurgery

Oral presentation

NousNav: an open-source, low cost, sustainable, and portable neuro-navigation system for LMIC

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**Objectives:** In order to democratize access to neuro-navigation technology to improve patient outcomes, we have developed NousNav, an open source neuro-navigation system that is designed for use in lower-resource settings. Hardware, software and training have been engineered to facilitate adoption and avoid typical issues hindering adoption of technology in LMIC.

**Background:** Computer-assisted neurosurgical navigation systems have proven an invaluable tool for the modern neurosurgeon, however the high cost, complexity, and reliance on consumables of these systems limits their applicability in lower-resource healthcare settings.

**Methods:** NousNav is assembled from low-cost off-the-shelf components in order to allow reproducing and deploying the system in any region. The key components are a motion capture 3D camera and a high end laptop running custom software built on the open source and widely used 3DSlicer platform. NousNav's software is also open source and specifically devised with lower-resource settings in mind. Hardware components are designed to not require use of single-use components in order to minimize costs and supply chain dependence. Comprehensive training has also been developed. The system has undergone bench-top testing of accuracy in a head phantom to compare target registration error (TRE) to a commercial system. Prototype systems have been sited with neurosurgeons in several countries for usability testing, feedback, and training.

**Results:** Testing in an OR setting with a head phantom yielded 24 TRE measurements for each system. The average TRE across both trials for the commercial system was 2.63mm (SD 1.19mm), while the average TRE for NousNav was 3.24mm (SD 1.95mm). Prototype systems have been delivered to neurosurgeons in Rabat, Morocco; Kigali, Rwanda; and Dakar, Senegal. User feedback has allowed iterative improvement of hardware and software.

**Conclusions:** Low-cost, open source and sustainable neuro-navigation technology can be developed with accuracy comparable to commercial systems. In collaboration with partners in LMIC, the system is being tested and refined.



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## Hydrocephalus

Oral presentation

Endoscopic management of complex multiloculated hydrocephalus

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**Objectives:** Do ventriculography helps in management of complex hydrocephalus.

**Background:** MRI study gives a fairly better idea about the ventricular anatomy but assessment of communications between different loculations is still a challenge. Current study tries to evaluate different preoperative diagnostic modalities for accurate assessment of communication between different loculi. Preoperative planning and surgical strategies are discussed.

**Methods:** In last 10 years total 870 intraventricular endoscopic surgeries were performed in our centre out of which 37 were done for multiloculated hydrocephalus.

**Results:** Average ages of patients were 7.7 months (range, 1 month – 7 years). Average duration of follow up was 3.3 years. 58% were post infectious. Communications between different loculations were established by CT ventriculography in 50% of cases. Out of 15 cases in which only VP shunt was done 13 (86%) has to undergo revision surgery. In 26 patients in which only endoscopic septostomy was performed, 18 (69%) has to undergo revision surgery. Best results were obtained when endoscopy was combined with shunt surgery in which 64% has good outcome in long term follow up.

**Conclusions:** Best way to prevent complex hydrocephalus is to avoid complications during the initial treatment of hydrocephalus. CT/ MRI ventriculogram helps in proper decision making. Endoscopic fenestration followed by VP shunting offers maximum benefit to the patients of multiloculated hydrocephalus.

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## Oncology

ePoster presentation

### Intradural dermoid cyst of temporal fossa: case report

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**Objectives:** Present a case of 43-year-old woman with a diagnosis of recurrent intracranial dermoid cyst.

**Background:** Intracranial dermoid cysts are rare benign lesions that comprise <1% of all intracranial tumors. They are congenital, with a dermis-like capsule containing squamous epithelium and adnexal structures, presenting gradual growth, tend to present near the midline in the supratentorial compartment, mainly in the sellar, parasellar, frontonasal, and pineal regions, and up to two thirds of these tumors are found in the posterior fossa; rarely, they have an extradural location. Symptoms are nonspecific, rupture can result in aseptic chemical meningitis.

**Methods:** A 43-year-old patient with a history of excision of a dermoid cyst in 2005 and reintervention for excision of its recurrence in 2009 and 2015, began in 2019 with a headache of a moderate intensity associated with Generalized tonic-clonic seizure on only one occasion, during the study protocol a contrasted tomography of the skull was performed, observing a cystic lesion of heterogeneous content with well-defined edges which did not show enhancement in the contrasted phase, located in the right frontotemporal region, displacing midline structures and compressing the right lateral ventricle.

**Results:** Right frontotemporoparietal craniectomy is performed, at the dural opening a transition zone between brain parenchyma and the cyst capsule is observed, at its opening observing a non-fetid yellowish content of pasty consistency with hair follicles inside, it is not achieved total excision of the capsule due to its strong relationship with the lateral wall of the right lateral ventricle and vascular structures.

**Conclusions:** Intracranial dermoid cysts are benign tumors that rarely present intracranial invasion, their treatment is surgical and carries a high risk of morbidity and mortality in the event of the development of aseptic chemical meningitis, the total extraction of its contents and of the capsule decreases the risk of recurrence.

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## Trauma

ePoster presentation

Coexisting everted and depressed skull fracture in a child

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**Objectives:** A Case report.

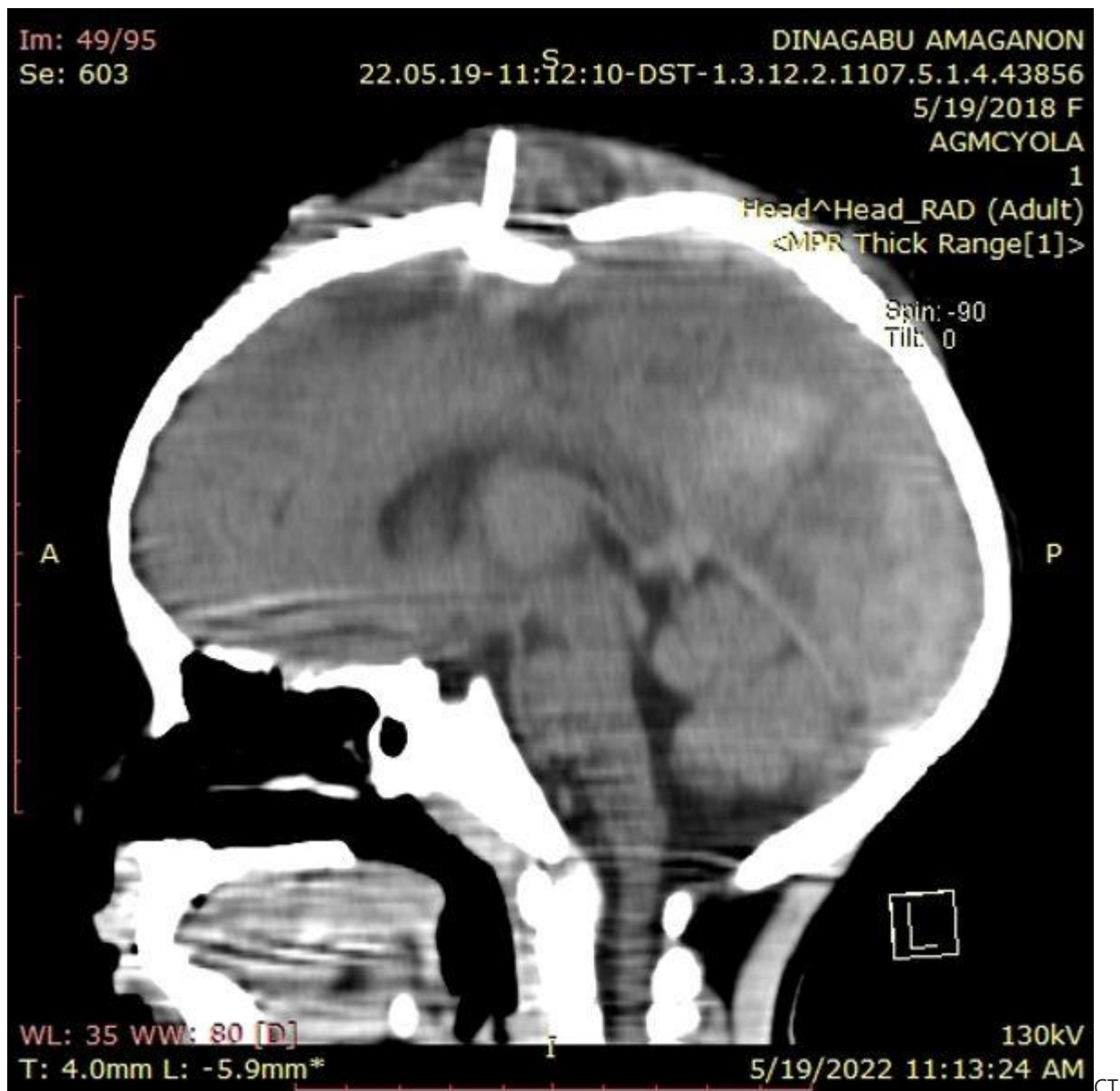
**Background:** Coexisting everted, and a depressed skull fracture has never been reported; moreover, their existence in a child.

**Methods:** Retrospective review of the patient's case file.

**Results:** A fracture is a breach in the continuity of a bone. Skull fractures are common among head-injured patients, especially calvaria involvement among children under two (2) years old. Skull fractures are classified based on their radiological pattern (linear, diastatic, comminuted, elevated, and depressed), their anatomic location (calvarium, basal), and their type (simple, compound). When the fractured segment is raised or depressed relative to the nearby normal skull bone, it is said to be an elevated or depressed skull fracture, respectively.

A distinct, rare form of an elevated skull fracture described as an everted type may result from a high-impact tangential force. Elevated skull fractures are rare among children compared to the depressed type.

We report a rare coexistence of an everted (an elevated type of skull fracture) and a depressed skull fracture in a 4-year-old girl, probably never reported in the literature.



Scan showing everted and depressed fracture with underlying contusion and oedema

**Conclusions:** An elevated skull fracture is an uncommon injury compared to a depressed one. An elevated skull fracture is frequently a compound fracture and should be managed aggressively. Depressed skull fractures are commonly associated with underlying brain injury. We bring forward a rare combination of a special elevated (everted) type and a depressed fracture coexisting in the same patient.

The need to recognize an everted fracture as an acceptable terminology in describing a particularly elevated skull fracture cannot be over-emphasized.

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## Spine

Oral presentation

### Vertebral bone quality score as a predictor of adjacent segment disease in lumbar interbody fusion surgery

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**Objectives:** To the authors' knowledge, this is the first study to investigate the utility of the vertebral bone quality (VBQ) score in predicting radiographic and surgical ASD in patients who have undergone lumbar interbody fusions.

**Background:** As lumbar fusion becomes the most commonly performed procedure in spinal surgeries, concerns have mounted over the potential for adjacent segment disease (ASD). The development of ASD is problematic because it can adversely affect functional outcome and necessitate reoperation.

**Methods:** A single center retrospective analysis was conducted for all patients undergoing one to three level lumbar interbody fusion between 2014 and 2021 with minimum 12-months follow-up. Demographic information was collected, alongside patients' medical, surgical and social history. Strict inclusion and exclusion criteria were adhered to. Univariate followed by multivariate logistic regression analysis were performed to identify the risk factors for radiographic and surgical ASD development. Receiver operating characteristic curve was completed to assess the diagnostic accuracy of VBQ score in predicting the outcomes of interest.

**Results:** A total of 417 patients were identified (mean age, 59.8±12.4 years; women 54.0%). Of those, 82 patients developed radiographic ASD (19.7%) and 58 developed surgical ASD (13.9%). On univariate analysis, VBQ score demonstrated as a significant predictor for both radiographic ASD (2.37±0.46 versus 3.25±0.37; p<0.001) and surgical ASD (2.33±0.50 versus 3.29±0.40; p<0.001), with a diagnostic accuracy of 96.3% (95%CI=94.1%-98.5%) and 93.4% (95%CI=90.3%-97.7%), respectively. On multivariate logistic regression, VBQ score had the highest odds for both radiographic ASD (odds ratio [OR]=1.601, 95% confidence interval [CI]=1.453-1.763; p<0.001) and surgical ASD development (OR=1.509, 95%CI=1.324-1.720; p<0.001).

**Conclusions:** Our study demonstrated the VBQ scoring system as a good predictor for radiographic and surgical ASD development. Preoperative VBQ score measurement may be a simple and cost-effective adjunct in lumbar fusion surgery planning.

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## Oncology

ePoster presentation

### Brain metastases: a single institute series focusing on surgically treated multiple metastases with subgroup analysis of recurring lesions post-SRS

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**Objectives:** To study the outcomes of patients receiving surgery for brain metastases. Subgroup analysis of surgical patients with multiple intracranial metastases and those post-SRS who had enlarging lesions resected.

**Background:** Brain metastases typically need a multimodal management. Neurological deterioration secondary to the metastasis often leads to morbidity and mortality irrespective of the extracranial disease.

**Methods:** A single institutional, retrospective, analysis of patients with brain metastases that underwent surgical excision over a 5-year period was performed. This study was conducted at Salford Royal Hospital, Manchester, United Kingdom. Patient records were accessed from the neurooncology database.

**Results:** A total of 203 patients had their brain metastases surgically treated from January 2018 until December 2022. Mean age of the group was  $59.57 \pm 12.40$  years. Lung (35%) and breast (18%) were the commonest location of primaries. Surgery was performed in 89 patients with multiple metastases with 18 undergoing simultaneous resection of >1 metastasis, 12 patients had neoadjuvant SRS and the remaining received some form of systemic treatment. The average OS was  $15.78 \pm 14.26$  months. Patients with solitary metastasis had mean OS of 16.53 months compared to 14.75 months for patients with 2 or more metastases. Patients with lung as primary had a lower mean OS (13.28 months) compared to those with breast as a primary (21.18 months). Patients who needed repeat intervention had a mean OS of 25 months compared to the 13 months seen in patients with no repeat intervention (survival bias likely in this observation)

On analysis of the 18 patients post-SRS who had surgery for enlarging lesion, it was found that 4 patients had radionecrosis on histology while the remaining 14 were recurrent metastasis.

**Conclusions:** Surgically treated multiple metastases show a poorer outcome as compared to solitary metastasis and require a multidisciplinary approach. Analysis comparing different treatment groups would help further treatment paradigms in these patients.

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## Neurovascular Surgery

ePoster presentation

### The big fat bombs of complex paraclinoid Internal Carotid Artery (ICA) aneurysm

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**Objectives:** The purpose of this study is to classified approach to different ICA segment and to analysed morphological factor that influenced surgical technique for paraclinoid ICA aneurysm.

**Background:** ICA aneurysm is one of the most common intracranial aneurysm and the aneurysm can be at any segments. Paraclinoid aneurysm has unique angioarchitecture and morphology. Having complex surrounding anatomy making surgical approach to these cases challenging.

**Methods:** From January 2022 until May 2023 total 174 cases of aneurysm was treated. 40 patients confirmed to have ICA aneurysm from cerebral DSA/CTA. Demographic study, clinical characteristics, radiological data including morphology and location, treatment plan and outcome were analysed.

**Results:** From 174 cases, 121 patients went for surgery and 53 endovascular interventions. The distribution of aneurysm according to location are analysed and total ICA aneurysm are 40 cases. 62.5% of them went for surgery and 37.5% endovascular intervention. 21 out of 40 cases are paraclinoid aneurysm. 5 out of 40 ICA aneurysm cases are giant or large ICA aneurysm. 4 out of these 5 patients went for bypass surgery. We divided approaches to ICA aneurysm according to segment and type or complexity of the aneurysm. We present sample of our paraclinoid cases:

- 1) Large cavernous ICA aneurysm – pterional craniotomy, pretemporal transcavernous and transylvian approach and clip reconstruction,
- 2) Large paraclinoid-cavernous ICA aneurysm – frontotemporal craniotomy, pretemporal transcavernous and transylvian approach, EC-IC bypass and clip reconstruction, and
- 3) Giant Supraclinoid ICA aneurysm – fronto temporal craniotomy, EC-IC bypass and ICA ligation.

**Conclusions:** In view of distinctive angioarchitecture and anatomical surrounding, surgical approach varies at different segment of ICA. Paraclinoid are most challenging segment. Based on our experience and literature review, we simplified surgical approach according to segment and our area of interest is paraclinoid. A proper strategy and planning may help in giving good outcome for patient.

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## Oncology

ePoster presentation

Insular glioma: correlation between intra-operative monitoring and the outcome in the trans-sylvian approach

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**Objectives:** The aim of this study is to evaluate the correlation between variations of the amplitude of motor evoked potentials obtained by direct cortical stimulation (MEP DCS) during surgical removal of insular glioma, and post-operative motor outcome.

**Background:** Insular surgery is a challenge for neurosurgeons. The trans-sylvian approach allows a careful control of perforating arteries and LSA.

The goal of insular glioma surgery is the maximum safe resection. The best outcome is fundamental for both patient's quality of life and the access to adjuvant therapies, therefore for survival. Motor tract monitoring is an essential guide during surgery and for predicting patient's outcome.

**Methods:** The inclusion criteria of this retrospective study were: insular glioma diagnosis, first surgery and Intraoperative Neurophysiological Monitoring assistance during surgery. A comparison between the MEP DCS baselines amplitude values and their variations during surgery was performed. The results were correlated with post-operative motor outcome.

**Results:** 49 patients (mean age 49 y) who underwent surgery in our department in the last 10 years were enrolled. MEP DCS amplitude values were unchanged in 32 cases (66%) and 25 patients (51%) showed unimpaired motor outcome after surgery. Statistical analysis confirmed a significant correlation between MEPs DCS variations and outcome. The instability of MEPs (9 cases) was considered separately and defined as variability in the amplitude of potentials or reduction of the persistence of the signal. Accuracy tests showed that the instability is predictive of favorable outcome: it increased specificity and positive predictive value of MEPs.

**Conclusions:** MEPs DCS amplitude variations in insular surgery represent a sensitive and specific indicator of outcome. The new introduced variable of instability is an important warning signal correlated with vascular damage and potentially reversible. Its early recognition leads to surgeon's prompt response with introduction of compensatory maneuvers in order to reverse the impending damage and avoid permanent motor deficits.



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## Paediatric

ePoster presentation

A case of traumatic intracranial aneurysm in a 6-year old child following a closed blunt head injury

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**Objectives:** This is a case of a 6-year-old male who had motor vehicular accident, presented well immediate post injury but followed up with recurrent seizures and motor weakness. The aim of the study is to review the pathomechanism of traumatic aneurysm in a blunt head trauma in a pediatric patient.

**Background:** According Emir et.al., traumatic intracranial aneurysms (TICA) following closed head injury comprise of less than 1% of all cerebral aneurysms associated with significant morbidity and mortality rate as high as 50%. Approach to pediatric aneurysms largely differ from that of adults.

**Methods:** The initial imaging done revealed a closed, depressed comminuted fracture in the left frontal bone. Eight days post injury, minimal interhemispheric subarachnoid hemorrhage was seen. Three weeks post-injury, he had recurrent generalized tonic clonic seizures and the repeat imaging shown in figure 1 (Fig1) showed an aneurysm and intracerebral hemorrhage (ICH).

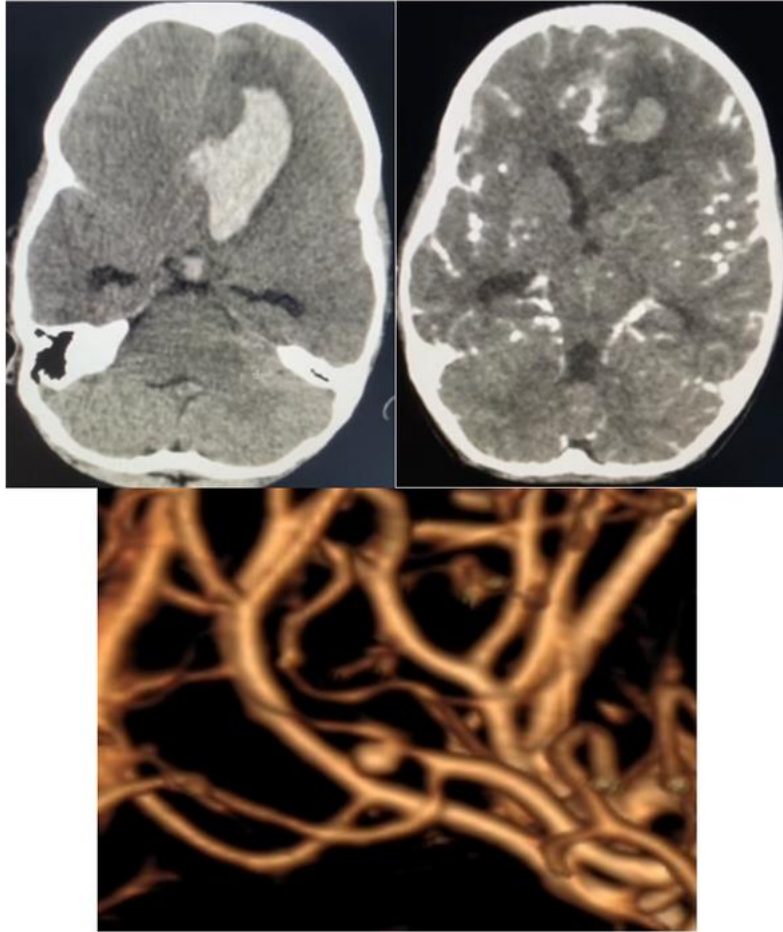


Fig1. Saccular aneurysm of the left A2

branch

The patient underwent bifrontal craniotomy, clipping of ruptured aneurysm and evacuation of the ICH. Treatment options include endovascular approach, wrapping and trapping the aneurysm. However, there is no single modality indicated for all lesions.

**Results:** Post-operatively, the patient was aphasic with right hemiparesis (2/5). Speech improved second week after the surgery. Rehabilitation was initiated during admission and patient was able to ambulate without support after 2 months. Work up for other possible causes of aneurysm in pediatric population revealed unremarkable findings.

**Conclusions:** TICAs may progressively grow, cause ICH and deterioration if not detected early. Hence aggressive treatment are generally needed. Mechanism associated with blunt traumatic head injury in the development of aneurysm could be due to a shear or rotational injury damaging vessels in close proximity to the dura, for instance in this case, close to the falx cerebri.

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## Education, Ethics, Socioeconomic

Oral presentation

Comparative analysis between urban vs. rural hospitals for patient demographics and perioperative outcomes after lumbar spinal fusion

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**Objectives:** We aimed to assess the impacts of rural hospital location on the outcomes of lumbar spine fusions.

**Background:** Rural location of patient's primary residence has previously been shown to be associated with worse outcomes secondary to limited resource availability in these parts of the United States. However, there is paucity of literature investigating the possible impacts a rural hospital location may have on the outcomes of lumbar spine fusions.

**Methods:** Using the National Inpatient Sample (NIS) database a search identified all patients who underwent a lumbar spinal fusion in the years, 2009-2020. These patients were then separated according to whether the treatment hospital was considered rural or urban. Univariate and multivariate linear/logistic regression models were utilized to analyze the data.

**Results:** A total of 2,863,816 patients were identified from this database, where 120,298 (4.2%) patients had their operation at a rural hospital, with the remaining patients in an urban hospital. Patients in the rural cohort were older ( $P < .001$ ), more likely to be white (89.97% vs. 81.73%,  $P < .001$ ), and have an increased rate of patients in the first (43.00% vs. 22.52%) and second (38.90% vs. 25.96%) quartiles of median household income when compared to the urban cohort. However, the urban population had patients had significantly increased rates of venous thrombosis (0.57% vs. 0.24%,  $P < .001$ ), and neurological injury (0.79% vs. 0.36%,  $P < .001$ ) after surgery. On multivariate analysis urban patients has significant increased odds of venous thrombosis (OR, 1.79; 95% CI, 1.32-2.41;  $P < .001$ ) and neurological injury (OR, 1.92; 95% CI, 1.46-2.53;  $P < .001$ ).

**Conclusions:** Patients who have surgery in rural hospitals are at risk for adverse outcomes after spinal fusion, and future research should investigate this to potentially resolve these disparities.

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## Oncology

ePoster presentation

### Sub-Saharan African experience of neurosurgical-oncologic care: challenges and barriers encountered at 7 cancer treatment centers

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**Objectives:** To better understand the challenges to neurosurgical-oncologic care in low resource settings, we collected data on national neurosurgery capacity and hospital diagnostic and treatment capacity across 7 national referral hospitals in 7 countries Sub-Saharan Africa (SSA).

**Background:** Wide disparities in neurosurgical-oncologic care and treatment outcomes exists globally despite recent improvements in diagnostics and cancer therapy.

**Methods:** A 42-item self-administered questionnaire was distributed to partner neurosurgeons at the 7 sites via REDCap in April 2023 to provide country and hospital level capacity data on neurosurgical-oncologic care.

**Results:** Neurosurgical and neurosurgical-oncologic care was reported to be available in a limited number of provinces/states/regions in 6 out of the 7 countries. The neurosurgery and pediatric neurosurgery workforce density across the 7 countries ranged between 0.02 – 0.67 per 100,000 and 0 – 0.05 per 100,000 respectively.

Three hospitals had no pediatric ICU with the remaining four having between 2-8 bed-capacity pediatric ICU. One hospital did not have both CT and MRI scanner available and relied solely on private diagnostic facilities for neuroimaging. Histopathology services were largely limited to basic hematoxylin and eosin (H&E) and/or advanced histopathology staining. Molecular subtyping was available at only one hospital.

None of the 7 hospitals had neurocritical care expertise, neuroradiologist, or neuropathologist. Four hospitals had a pediatric anesthesiologist. Only one hospital had a neuro-oncologist, but none had a pediatric neuro-oncologist. Both adjuvant chemotherapy and radiotherapy was unavailable at 3 hospitals. Rehabilitation was largely limited to basic physical and occupational therapy at all 7 hospitals.

Although all 7 countries had a multiple health payer system, the payment structure differed across the 7 hospitals for different neurosurgical-oncology services with patients making out-of-pocket payments for all services in some cases. Financial constraint was reported as a major barrier to care.

**Conclusions:** System-level interventions are needed to strengthen neurosurgical-oncologic care capacity in SSA.

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## Oncology

ePoster presentation

Implementation of neuro-oncology multidisciplinary team meetings: Ivorian experience

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**Objectives:** The aim of this study was to describe our multidisciplinary neuro-oncology team, to evaluate its impact on clinical management decisions and discuss perspectives.

**Background:** The management of patients with cancer involving the central and peripheral nervous system is complex requiring a coordinated team of specialists. Multidisciplinary neuro-oncology team meeting started in Ivory Coast at March 2019. The staff consisted of neurosurgeons, neuroradiologists, oncologists, neurooncologists, radiotherapists and neuro-anatomopathologists.

**Methods:** We conducted a retrospective evaluation of the cases discussed at our multidisciplinary team meetings, from March 2019 to March 2023. Demographic, clinic, radiological, pathological and other specifics data were extracted.

**Results:** We collected 150 patients, with a mean number of patients presented of 7.1 by meeting. The median age was 39.88 years, with a sex ratio of 1.3. Supratentorial tumors were the most common (50%), and the most common histological types were glial tumors (29.33), carcinomas (26%) and meningiomas (10%). Therapeutic modalities were surgery, radiotherapy and chemotherapy. 20.66% of patients underwent radiotherapy, and postoperative radiotherapy was instituted in 19.33% of patients. 23 patients died.

**Conclusions:** Benefits of neuro-oncology multidisciplinary team meetings include efficient coordination of multiple providers, direction for complicated cases, open communication among care teams, education, increased adherence to published guidelines, and clinical trial access. Although the prognosis remains relatively poor in our countries, multidisciplinary team meetings remain a hope for improving the prognosis and management of patients.

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## Paediatric

Oral presentation

### Pediatric craniovertebral junction instability: operative outcomes & intricacies

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**Objectives:** We describe our experience and the challenges faced along with solutions, following multiplanar realignment and short-segment C1-C2 fusion in children with congenital atlantoaxial dislocation.

**Background:** The management aspects of pediatric congenital atlantoaxial dislocation (CAAD)/ / basilar invagination differ from that of the adults. Softer bones, highly deformed joints and fusion of multiple vertebral levels with potential for spinal growth impairment in younger age are unique challenges unique pertaining to this age group.

**Methods:** A total of 56 pediatric patients with congenital AAD underwent C1-C2 posterior reduction and fixation. The oblique joints were drilled, and remodeled to achieve multiplanar realignment. The baseline clinico-radiological data were compared with that of the follow up.

**Results:** The series included 35 cases with irreducible and 21 cases with reducible AAD; the former had a higher incidence of bony anomalies, and the joints were more oblique and deformed. Nine patients had lateral angular dislocation, 3 had C1-C2 spondyloptosis and 5 had significant vertical dislocation. The C1-C2 joint drilling and manipulation was feasible in all patients. The operative techniques were modified to achieve an optimal bony purchase secondary to the drilling of relatively small bones and also avoid screw pull out during intraoperative manipulation. Despite some challenges in few initial cases, realignment could be achieved in all. At follow up, there was a significant improvement in mJOA score in 95.8 % of cases, with 28 patients being independent.

**Conclusions:** Children show relatively high oblique C1-C2 joints and therefore a frequent occurrence of spondyloptosis, severe vertical dislocation and lateral tilt. Despite the soft and small pediatric bones, a multiplanar realignment could be achieved by C1-C2 joint drilling and manipulation. The short segment C1-C2 fusion offers satisfactory clinical and imaging outcome in pediatric CAAD.

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## Spine

Oral presentation

Kyphoplasty versus posterior spinal fixation in treatment of traumatic burst thoracolumbar fractures; a randomized clinical trial

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**Objectives:** To compare the functional outcome and spine parameters in patients with traumatic burst thoracolumbar fractures undergoing kyphoplasty versus posterior spinal fixation and instrumentation.

**Background:** Treatment of traumatic burst thoracolumbar fractures in young individuals is still a debate. Posterior spinal fixation, instrumentation and kyphoplasty are options of therapy. But enough data are not available for supporting each.

**Methods:** This prospective randomized clinical trial included 87 adult patients (>18 years) with traumatic thoracolumbar (T10 to L5) vertebral fractures presenting to our center. We included those with burst fractures with intact posterior ligamentous complex (PLC). Those with spinal cord injuries were excluded. The patients were randomly assigned to undergo kyphoplasty (n=44) or posterior spinal fixation (n=43) in the same center. The patients were followed for 12-month postoperatively. We have compared the two study groups regarding the radiological parameters (kyphotic angulation, height), pain measured by visual analogue scale (VAS), functional quality of life using the Oswestry disability index (ODI). The intraoperative and postoperative indices were also compared.

**Results:** The VAS score was significantly lower in kyphoplasty group after the intervention (P<0.001), 1 month (P<0.001), 3 months (P<0.001), 6 months (P<0.001), and 12 months (P<0.001) after the intervention. In addition, the ODI was significantly lower after the intervention (P<0.001), 1 month (P<0.001), and 3 months (P<0.001), after the intervention while it was comparable in 6 months (P=0.128) and 12 months (p=0.218) after the surgery. The hospital stay was comparable between the two study groups (P=0.095). The kyphotic angulation (P=0.068) and vertebral height (P=0.095) was also comparable between the two study groups after 12 months of intervention.

**Conclusions:** Kyphoplasty is superior to posterior spinal fixation with regards to better pain and short-term functional recovery after surgery. Kyphoplasty is comparable to posterior spinal fixation in kyphotic angulation and vertebral height in those with traumatic burst thoracolumbar fractures.

## Skull Base

ePoster presentation

### Surgical approaches to anterior foramen magnum meningioma: a systematic review

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#### Objectives:

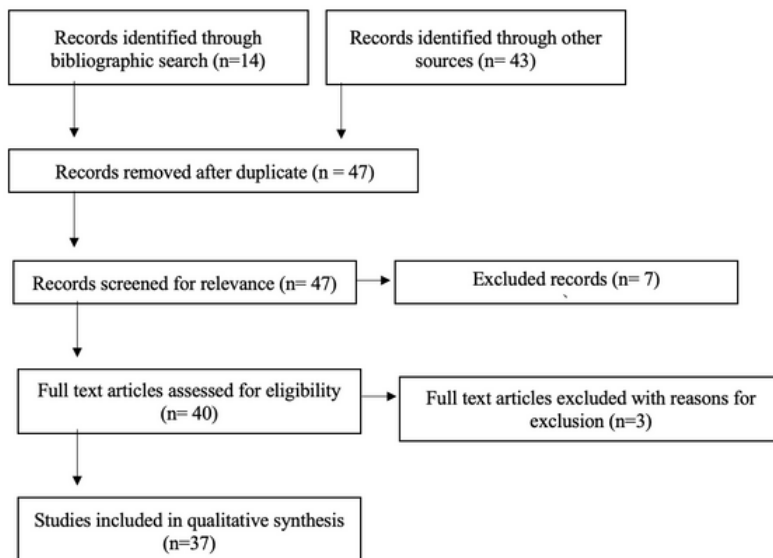
Considering the various nomenclatures described throughout scientific history, this current study aims to systematize the possible approaches, including variations in nomenclature and additional techniques for treating anterior foramen magnum meningiomas.

#### Background:

Foramen magnum meningiomas have been described since 1955 and have posed a clinical and surgical challenge due to late diagnosis and difficult topography. Over time, surgical approaches have adapted and new nomenclatures have been created, turning classification difficult and often leading to literary confusion.

#### Methods:

The MEDLINE/PUBMED database was used. The following search terms were applied: ((foramen magnum meningiomas[Title/Abstract]) OR (meningiomas of foramen magnum[Title/Abstract])) AND (surgical approach[Title/Abstract]). The PRISMA method for systematic reviews was applied.





**Results:**

A total of 37 studies were selected after PRISMA methodology. The lateral approach was proposed as an extension of the posterior approach, aiming for better control of the vertebral artery in most cases and the sigmoid sinus in some cases. Next, a variation of the posterior approach was proposed, with an additional technique called condylar drilling or resection, known as the extreme lateral approach. It involves transposing the vertebral artery aiming to expand the surgical corridor. For an accurate lateral view, the far lateral approach was introduced. It involves less condylar drilling, resection of the inferolateral margin of the foramen magnum, and posterolateral removal of the atlas arch. Among the studies and their described approaches: posterolateral 32%, far lateral approach 36%, transcondylar 20%, extreme lateral 8%, and retrocondylar 4%.

**Conclusions:**

Considering the description, function, and objective of each defined approach, it is crucial to use them according to the specific classification. It is important to understand that these approaches are not fundamentally different from each other but rather variations that have been refined over time. Such knowledge is essential for achieving optimal performance treating this pathology.

## Global Neurosurgery

ePoster presentation

White matter patterns, integrity & interactions in glioma patients: a scoping review of both quantitative and qualitative evidence

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**Objectives:** We mapped out the existing body of literature involving patterns and alterations in the integrity and connectivity of white matter tracts (WMT) identified through diffusion tensor imaging (DTI) tractography in glioma patients. We highlighted meaningful correlations between the aforementioned parameters and critical domains such as diagnosis, prognosis, presurgical risk assessment, and modification of surgical strategies.

**Background:** Gliomas are characteristically known for their distinct propensity to grow and infiltrate along the WMT necessitating the need to investigate changes in WMT using DTI tractography.

**Methods:** In this study, Arksey and O'Malley methodological approach was used along with snowballing methods. Search strategy involved electronic databases (PubMed, OVID, Cochrane library, clinicaltrials.gov) and grey literature (Google scholar) with records from data inception until March (Week 2, 2023). Independent screening was done followed by data charting according to a predefined taxonomy.

**Results:** We correlated preoperative diffusion parameters with postoperative deficits such as preoperative WMT integrity of language tracts with postoperative aphasia, WMT integrity of optic tracts and radiations with poor vision, or disconnection of motor tracts with neurological performance scores. Where no significant associations were seen, like with Frontal Aslant Tract with long-term language deficits, there was an increased acceptability for tract sacrifice in glioma surgery. Apart from the literature available on traditional diffusion metrics and standard tract profiles, we found novel metrics like tract lateralisation and symmetry notably in the case of Arcuate Fasciculus, implication of subcortical pathways in various tumour types and paucity of diffusion changes in executive functions. Furthermore, we demonstrated the presence of microstructural diffusion changes in glioma-associated epilepsy patients without changes in macrostructural WMT integrity.

**Conclusions:** DTI tractography is a crucial biomarker for facilitating presurgical planning, enhancing postoperative rehabilitation potential and allowing maximal safe resection of eloquent-area tumours intimately linked to epilepsy, language, speech, motor deficits and visual and cognitive impairments.

## Paediatric

ePoster presentation

### Hemispherotomy for medically refractory epilepsy in long-survivor of congenital GBM

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**Objectives:** This case enabled us to explore the quality of life in long survivors of congenital GBM and study the impact of hemispherotomy in managing medically intractable epilepsy.

**Background:** Congenital Glioblastoma multiforme is a WHO Grade IV tumour that occurs infrequently in infants. Although the prognosis is usually poor, long-term survivors are reported.

**Methods:** We describe in depth the case of a 2-week-old male infant who was initially managed for congenital GBM and developed medically refractory epilepsy 32 months later.

**Results:** Patient initially presented in December 2020 with prolonged jaundice and frequent 2-minute episodes of rhythmical kicking in his right leg that occurred multiple times a day. An MRI confirmed a tumour with extensive haemorrhage in left temporal lobe, measuring 74 x 54 x 60 mm, accompanied by adjacent satellite haematomas. The successful debulking was performed over two stages to achieve gross microscopic tumour-free margins. This was then followed by 3 cycles of Infant HGG chemotherapy and treatment was concluded in July 2021 after 3-monthly surveillance. Follow-up MRIs did not display evidence of disease recurrence. For 11 months after conclusion of treatment, the patient was doing well, with comprehensive support to help with his delay in gross motor development, baseline right sided weakness and increased tone. However, since April 2022, the patient developed right sided epileptic spasms that gradually progressed to involve all 4 limbs. Video telemetry EEG confirmed wide-spread seizure activity originating from left hemisphere. No tumour recurrence was identified by clinical imaging. The worsening of the epileptic activity and medical intractability prompted referral for hemispherotomy management.

**Conclusions:** A subpopulation of patients diagnosed with congenital GBM, live to significant adult age. Hence it is important to expand our literature and understanding of the impact and efficacy of neurosurgical interventions in this subpopulation at multiple stages in the course of the disease.

## Oncology

ePoster presentation

### Feasibility and outcomes of intraoperative executive function assessment: a systematic review

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**Objectives:** The objective of this study is to review the studies conducting ioBM of EF in AC. We further assess the Extent of Resection (EOR) following intraoperative EF preservation, correlation with location, neuropsychologic outcomes, the feasibility of ioBM of EF, and potential adverse effects.

**Background:** Awake Craniotomy (AC) allows maximal safe resection of the lesion with preservation of eloquent functions using intraoperative brain mapping (ioBM). Conventionally, motor and language functions are mapped, while executive function (EF) assessment and preservation is uncommon. Deficits in EFs may lead to occupational, personal, and social impairments, thus, suboptimal quality of Life.

**Methods:** A comprehensive literature search was conducted through Medline, Scopus, and Cochrane Library using a pre-defined search strategy. Articles were selected after duplicate removal, initial screening, and full-text assessment. The demographic details, ioBM techniques, intraoperative tasks, and their assessments, EOR, postoperative, follow-up changes in EF and neurocognitive status, feasibility, and potential adverse were reviewed.

**Results:** Thirteen studies with intraoperative EF assessment of 351 patients were reviewed. Most studies performed ioBS using bipolar stimulation, with a frequency of 60 Hz, pulse durations ranging 1-2 ms, and intensity ranging from 2 to 6 mA. Awake-asleep-awake protocol was most commonly used. The tasks used to monitor cognitive functions included the Stroop task, line-bisection test, spatial-2-back test, trail-making-task, and digit-span tests. All studies reported similar or better EOR in patients with ioBM for EF. When comparing the neuropsychologic outcomes of patients with ioBM of EF to those without, all studies reported significantly better EF outcomes in ioBM groups. Most authors reported EF mapping as a feasible tool to obtain satisfactory outcomes. Adverse effects included intraoperative seizures, which were easily controlled.

**Conclusions:** AC with ioBM of EF is a safe, effective, and feasible technique that allows satisfactory EOR and improved neurocognitive outcomes, and minimal adverse effects.

## Oncology

Oral presentation

### Prediction of tumor-associated antigens using radiogenomics

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**Objectives:** We propose leveraging radiogenomics using machine learning based on Pre-Op MRI to predict tumor antigen expression profiles displaying specific targets for immunotherapy.

**Background:** Glioblastoma remains a disease with dismal prognosis. Immunotherapy demonstrated promising results against some refractory cancers. However, comparative results have not been accomplished in glioblastoma due to lack of suitable tumor-targets and considerable clonal heterogeneity.

**Methods:** We collected RNAseq data and Pre-Op Axial T2-FLAIR images in 29 patients from IVY Glioblastoma Atlas Project. MRIs were segmented using LIFEx software as follows: 1)tumor+edema (T+E) and 2)whole brain (WB). The intended prediction was for tumor-associated antigens. H2O.ai software was used for prediction using an automated supervised machine learning algorithm. Antigens that achieved >55% AUC (i.e., prediction) were reanalyzed adjusting for reproducibility, time of analysis and maximum precision.

**Results:** An average of 53.2 T2-FLAIR axial slices per patient were used for 3D reconstruction. We selected the following genes(ERBB2, TP53, IL10RA, CD163, EGFR and MGMT)for downstream analysis given their clinical, immunologic, and prognostic relevance. Regarding tumor-associated antigen prediction for ERBB2, TP53, IL10RA, CD163, EGFR and MGMT predicted 52%, 56%, 66%, 66%, 56% and 0%, on T+E segmentation respectively(Figure 1); The values were 49%, 93%, 87%, 47%, 37% and 0% for the respective WB group(Figure 2). Reanalysis revealed 100% prediction accuracy for the presence of mutant TP53 and IL10RA in both segmentation groups (T+E, WB). CD163 and EGFR prediction was 54% and 61% for the T+E group and 48% for both antigens in the WB group.

**Conclusions:** We successfully predicted the presence of two out of six antigens (i.e., mutant TP53 and IL10RA) in this patient cohort. Our approach can provide expeditious antigen identification to enable cellular therapy manufacturing for patients with unresectable newly diagnosed tumors or those which relapsed geographically. Furthermore, this methodology might provide a precision medicine approach to places that cannot afford costly testing (i.e.,RNAseq).

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## Global Neurosurgery

ePoster presentation

### Establishing a formal medical student curriculum for international neurosurgery rotations in Nepal

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#### Objectives:

- Highlight the need for more structured, goal-oriented curricula for international neurosurgery rotations at the medical student level.
- Provide an example of collaborative curriculum development between American and Nepalese training programs.

**Background:** The field of global neurosurgery is growing rapidly and encompasses work related to capacity-building, advocacy and health equity, international research collaborations, and diversification of trainee education. While there are many existing formal residency exchange programs and institutional partnerships, there is a lack of standardization in medical student international neurosurgery rotations. A more structured, evidence-based design of these experiences would benefit both student learning and ability to contribute to local patient care.

**Methods:** A comprehensive review of the existing literature on international neurosurgery rotations in medical school and residency was performed and used to assess the overall availability of opportunities, structure and duration of rotations, and common rotation locations. As the result of a new partnership between Virginia Tech Carilion and Bir Hospital in Kathmandu, Nepal, an interview-based needs assessment was conducted with residents and faculty to identify areas of focus that would promote positive changes in practice and serve as beneficial learning opportunities for students.

**Results:** Principles of established curricula for existing global surgery rotations and elements specific to the regional needs in Nepal were integrated to produce a novel month-long curriculum for medical students in global neurosurgery. Interdisciplinary areas of study for students included differences in culture, financial frameworks, and medical education systems.

**Conclusions:** Providing exposure to neurosurgical practice in different settings has the potential to increase interest in global neurosurgery among medical students, provide a foundation for continuing impactful work in residency, and support the formation of lasting partnerships early in their career. This case study exemplifies how the collaborative and structured development of a global neurosurgery curriculum for medical students can lead to a more successful rotation experience.

## Neurovascular Surgery

Oral presentation

Outcome of aneurysmal SAH in elderly patients and predictive factors: review of 10 years' data of a single quaternary centre

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**Objectives:** As the global population continues to age, there is an increasing number of elderly patients presenting with aneurysmal subarachnoid haemorrhage (SAH). The objectives of this study were to review the clinical outcome in elderly patients and identify predictive factors associated with these outcomes.

**Background:** Different centres have diverse approaches regarding the management of these patients, some adopting more aggressive and others more conservative strategies. The optimal management remains uncertain. By reviewing our data, we aimed to identify the outcomes of this particular patient group, the most important predictive factors and early complications that have a significant impact on the outcome.

**Methods:** We considered 'elderly patients' 70 years and above at presentation. All consecutive admissions with aneurysmal SAH over a 10-year period were retrospectively reviewed. Data such as performance status at admission and discharge, clinical and radiological grade, co-morbidities, early complications (e.g. hydrocephalus, vasospasm) was analysed. A total of 110 patients treated at our centre were identified, with a mean age of 77.

**Results:** During admission 19 patients died (17%). Among the 91 survivors, 50 (55%) had recovered well at discharge (mRS 0-3). Eighteen patients with poor performance (44% of this subgroup) were admitted with WFNS Grade 4 or 5, 31 (76%) had Fisher Grade 4, 27 patients (66%) had hydrocephalus on admission, and 18 (44%) had clinically significant vasospasm at some point during admission.

**Conclusions:** Given the nature of this study one must be cautious extracting conclusions. Our series demonstrates that a good proportion of these patients recovered well from the event with adequate treatment. The impact of co-morbidities and complications of SAH in the outcome was not that dissimilar to other age groups. We believe age per se should not be a criterion in the decision-making process of these patients. A prospective multi-centre study would address these questions more robustly.

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## Oncology

ePoster presentation

Mid-third giant bifalcine meningiomas: unilateral operative approach utilizing an oblique trajectory and falx window

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**Objectives:** We report the surgical nuances and clinical outcome of patients with giant bilateral symmetrical mid-third falcine meningiomas resected through a modified unilateral approach.

**Background:** Usually, meningiomas are excised using the shortest possible trajectory. However, such an approach for mid-third falcine meningiomas endangers the adjoining draining veins and eloquent cortex. A larger size and bilaterality of the tumors adds to the surgical complexity.

**Methods:** Seven patients were operated with this technique, and the clinico-radiologic details were evaluated at presentation and at the follow-up. The surgical trajectory was dependent on whether the meningiomas were located in the anterior or posterior half of mid-third of falx. The tumor was excised through an unilateral oblique anterior or posterior trajectory instead of directly working over the draining veins. The Falx was incised to create a surgical window and access the tumor on the contralateral side.

**Results:** In 5 patients, the meningiomas were present in the anterior half. Two had tumor in the posterior half of mid-third of falx. Grade II Simpson excision was achieved in 6 patients. One patient showed small residual tumor and underwent stereotactic radiosurgery. The overall mean follow up was 9.8 months. All the patients had good clinical outcome.

**Conclusions:** Giant bifalcine meningiomas can be safely resected through a unilateral approach. Creating a Falx window helps to remove tumor from contralateral side. An oblique trajectory rather than the widely practised end-on access is likely to minimize the risk of venous and cortical injury.



## Paediatric

Oral presentation

The use of Non-Invasive Halo System (NIHS) in Atlantoaxial rotatory subluxation / fixation in childhood (AARF)

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**Objectives:** The conventional Halo brace has been the gold standard for external immobilization of the cervical spine in children, stabilizing the craniocervical junction, however the invasive stabilization pins introduced complications. Hence interest in NIHS grew, but its ability in providing clinically resonant stabilization with a better safety profile, remains to be established.

**Background:** This is a retrospective case series to describe the use of pin-less Non-Invasive Halo System (NIHS) for the purpose of Atlantoaxial rotatory fixation in childhood (AARF).

**Methods:** We performed a retrospective review of 2 patients treated for Type 1 Atlanto-Axial rotary subluxation (AARS) / Atlantoaxial rotatory fixation (AARF) in childhood with the help of immobilization provided by NIHS. We also reviewed a case of Atlanto-Occipital dislocation (AOD) which was successfully managed with the NIHS. We reviewed the patients' clinical and operation case notes to collect data regarding admission, indications for orthotic management, follow-up regimen, challenges associated with the NIHS and weaning plan. These data, coupled with imaging studies enabled us to study the functional (neurological status) and physical (cranio-cervical alignment and healing) outcomes as well as complications.

**Results:** The patients spent 6-12 weeks on NIHS. It was noted that application of the NIHS was a clinically effective and safe method of stabilizing the atlanto-axial and atlanto-occipital junctions with sustainable radiological and physical alignment. The brace was well tolerated by the patients, and we noted the importance of a multi-disciplinary and stepwise approach in ensuring this. Nevertheless, due to the lack of invasive pins, the pressure points were instead translated to the skin on bony prominences, hence our patients experienced varying degrees of compromises to their skin.

**Conclusions:** The NIHS is an effective treatment option for realignment and stabilization of paediatric AARS and AOD. Careful attention is required for the best type of padding and pressure distribution to protect the patient's skin.

## Neurovascular Surgery

ePoster presentation

### Feasibility and outcomes of awake craniotomy for brain arteriovenous malformations: a scoping review

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**Objectives:** We reviewed the current literature reporting surgical outcomes and assessed the feasibility of AC for AVM resection.

**Background:** Brain Arteriovenous Malformations (AVMs) located in proximity to eloquent brain regions are associated with poor surgical outcomes, which may be due to higher rates of postoperative neurological deterioration. Current treatment protocols include stereotactic radiosurgery, trans-arterial embolization, and surgical resection under general anesthesia. Awake Craniotomy (AC) allows intraoperative mapping of eloquent areas to improve post-operative neurologic outcomes.

**Methods:** The PRISMA guidelines were utilized as a template for the review. Three databases including PubMed, Scopus, and Cochrane Library were searched using a predefined search strategy. After removing duplicates and screening, full texts were analyzed. Outcomes including the extent of resection, intra-operative and post-operative complications, and long-term neurologic outcomes were assessed.

**Results:** Twelve studies were included with a total of 122 AVM cases. Spetzler–Martin grading was used for the classification of the AVMs. The asleep–awake–asleep protocol was most commonly used for AC. Complete resection was achieved in all cases except 5. Intraoperative complications included seizures (n=2) and bleeding (n=4). Short-term post-operative complications included hemorrhage (n=3), neurologic dysfunctions including paresis (n=3), hemiplegia (n=10), dysphasia/aphasia (n=6), cranial nerve dysfunction (n=3), and pulmonary embolism (n=1). Almost all neurological deficits after surgery gradually improved on subsequent follow-ups, and neurologic outcomes were more satisfactory when compared to stereotactic radiosurgery or surgical resection under general anesthesia.

**Conclusions:** AVMs may shift the anatomical location of eloquent brain areas which may be mapped during AC. AC is a viable approach for AVM resection with better postoperative outcomes compared to surgical resection under GA or SRS. All studies recommended AC for the resection of AVMs in close proximity to eloquent areas. The authors conclude that AC can be implemented as standard-of-care for AVM resection near eloquent language and motor areas.

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## Global Neurosurgery

ePoster presentation

Unloading surgical gown to support the surgeon's hands at rest and during work

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**Objectives:** To create a simple device to support the hands of surgeons and assistants at rest, and to stabilize them while working with microsurgical instruments. To evaluate its functionality.

**Background:** Due to the need to keep the hands on the weight for a long time while working, neurosurgeons are subject to chronic positional discomfort and an increased risk of developing orthopedic diseases of the upper extremities. Also, muscle fatigue increases physiological tremor, which can provoke intraoperative complications.

**Methods:**



**Fig. 1.** Unloading surgical gown. From left

to right: general view of the gown; fixation of the arms with thoracic loops at rest; fixation of the arms with brachial loops at rest; stabilization of the arms with thoracic loops during work; tools in pockets.

We have developed an unloading surgical gown (**Fig. 1**) containing thoracic and brachial loops designed to fix the surgeon's hands at rest and during work. Additionally, under the thoracic loops there are pockets for storing the most popular surgical tools (scissors, tweezers, aspirator, etc.).

**Results:** According to our drawings, prototypes of the unloading gown were made and tested at the Burdenko Neurosurgery Center during microneurosurgical operations lasting more than 3 hours. Positive feedback was received from surgeons and assistants.

**Conclusions:** The unloading surgical gown allows one to reduce the positional discomfort of surgeons and assistants during rest, as well as partially stabilize movements during work. An additional advantage is that the pockets allow to always have the up-to-date tools at hand.

The proposed gown can be useful for surgeons and especially assistants in any surgical specialty.

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## Spine

Oral presentation

Inhibition of Mir-199a alleviates intervertebral disc degeneration by regulating the peroxisome proliferator-activated receptor  $\gamma$ /nuclear factor- $\kappa$ B pathway

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**Objectives:** This study aimed to investigate the effect and potential mechanism of miR-199a in IDD.

**Background:** Intervertebral disc degeneration (IDD) is the main pathogenesis of low back pain. MicroRNAs (miRNAs) have been found to exert regulatory function in IDD.

**Methods:** A vitro cell model of IDD was established by treating human nucleus pulposus cells (HNPCs) with interleukin-1 $\beta$  (IL-1 $\beta$ ). The level of peroxisome proliferator-activated receptor  $\gamma$  (PPAR $\gamma$ ) was examined in the IDD cell model by Western blot and quantification real-time reverse transcription-polymerase chain reaction (qRT-PCR). The expression level of miR-199a was detected by RT-qPCR. Effects of PPAR $\gamma$  or/and PPAR $\gamma$  agonist on inflammatory factors, extracellular matrix (ECM), apoptosis, and nuclear factor- $\kappa$ B (NF- $\kappa$ B) nuclear translocation were examined through enzyme-linked immunosorbent assay (ELISA), Western blot, flow cytometry assay, and immunofluorescence staining. The starBase database and dual luciferase reporter assay were used to predict and validate the targeting relationship between miR-199a and PPAR $\gamma$ , and rescue assay was performed to gain insight into the role of miR-199a on IDD through PPAR $\gamma$ /NF- $\kappa$ B signaling.

**Results:** PPAR $\gamma$  expression reduced with concentration and time under IL-1 $\beta$  stimulation, while miR-199a expression showed the reverse trend. Upregulation or/and activation of PPAR $\gamma$  inhibited IL-1 $\beta$ -induced an increase in inflammatory factor levels, poptosis, degradation of the ECM, and the nuclear translocation of NF- $\kappa$ B. MiR-199a was highly expressed but PPAR $\gamma$  was lowly expressed in IDD, while knockdown of PPAR $\gamma$  partially reversed remission of IDD induced by miR-199a downregulation.

**Conclusions:** MiR-199a promoted NF- $\kappa$ B entry into the nucleus but PPAR $\gamma$  inhibited this process. Inhibition of miR-199a suppressed IDD progression by regulating the PPAR $\gamma$ /NF- $\kappa$ B pathway. MiR-199a may be a promising target for IDD treatment clinically.

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## Paediatric

Oral presentation

### Subduroperitoneal drainage without a valve - an effective solution for chronic subdural collections in children

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**Objectives:** To treat chronic subdural collections in children under two years of age with subduroperitoneal drainage without a valve.

**Background:** Chronic subdural collections occur mainly in children under two years of age. They are primarily bilateral and of traumatic origin. They contain a mixture of decaying blood elements, proteins, and cerebrospinal fluid. We, therefore, refer to them as hematoma-hygromas. The optimal management of these collections remains controversial.

**Methods:** We retrospectively evaluated pediatric patients (under two years of age) with valveless subduroperitoneal drainage (SPD) who underwent surgery for chronic subdural collections in 2018-2020. Most patients first had a reservoir with a subdural catheter inserted, which was regularly punctured. Only when this therapy failed a valveless SPD was inserted, in all cases primarily on one side.

**Results:** From January 2018 to December 2020, we implanted valveless SPD in twelve children with a mean age of seven months (5-18). The etiology was eight cases of abused child syndrome; two children were after endoscopic third ventriculostomy and two after resection of giant tumors (plexus papilloma and pilocytic astrocytoma). We revised the drainage in four patients: twice we converted it to ventriculoperitoneal for the development of hydrocephalus (at one month and four months), once we changed an obturated subdural catheter, and once we removed the drainage at three months for overdrainage syndrome. Four of the twelve children are already walking, five are already sitting, and three remain lying.

**Conclusions:** For chronic subdural collections in young children, subduroperitoneal drainage is often necessary. Our experience shows that it is sufficient to implant it only unilaterally and that the "valveless" drainage configuration usually does not cause complications from overdrainage syndrome in these children.

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## Oncology

ePoster presentation

### Glucose metabolism and coagulation in meningioma patients - a preliminary study

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**Objectives:** The aim of our study was to determine the possible connection between glycated hemoglobin and standard coagulation factors such as prothrombin time (PT) and activated partial thromboplastin time (APTT).

**Background:** Meningiomas are among the most common tumors of the central nervous system. One of the most frequent and detrimental complications which occur in meningioma patients is venous thromboembolism (VTE). Recognizing patients who are at a higher risk of hypercoagulability and subsequent VTE is considered paramount in the treatment of meningioma patients. The connection between systemic glucose metabolism and the coagulation status is known for decades. However, the research looking into this relationship in meningioma patients is virtually non-existent.

**Methods:** We analyzed 27 patients with intracranial meningiomas and collected their blood samples which were tested for HbA1c and the coagulation factors prothrombin time (PT) and activated partial thromboplastin time (APTT). PT and APTT were both measured with routine coagulometry, while HbA1c was analyzed using high-performance liquid chromatography. Data analysis was performed using the SPSS Statistics software package, the Pearson correlation coefficient was calculated in order to test if there was a statistically significant correlation. The statistical significance was set at  $p$  (two-tailed)  $< 0.05$ .

**Results:** Our sample included 27 patients with intracranial meningiomas. Statistically significant correlation was found between the values of APTT and HbA1c ( $r = -0,39$ ;  $p < 0,05$ ), indicating that chronically high levels of glycemia could lead to a hypercoagulable state. No such correlation was found between HbA1c and PT values.

**Conclusions:** APTT is a very important measurement in the routine clinical practice. Its' lower values have been correlated to several coagulopathies, especially in cancer patients. Our research shows how this routine lab result can potentially show very important information about meningioma patients, namely which patients could be at a higher risk of hypercoagulability and subsequent VTE. Further research is therefore needed to elucidate this relationship.

## Hydrocephalus

Oral presentation

Does ventriculomegaly correlate with intelligence and cognition? Neuropsychological findings and profile in longstanding overt ventriculomegaly of adults (LOVA)

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**Objectives:** To establish a neuropsychological profile for patients with ventriculomegaly.

**Background:** Ventriculomegaly has been often associated with cognitive impairment, nevertheless objective data defining this patient cohort is lacking, signaling a knowledge gap. With increasing availability of imaging comes a subsequent rise in the number of cases referred to hydrocephalus services. Our aim was to outline the neurocognitive findings in this patient group.

**Methods:** This is a prospective, single-center, case-series study of patients diagnosed with longstanding overt ventriculomegaly of adults (LOVA). Demographic and radiological data as well as symptoms at presentation, profession, employment and detailed neurocognitive profile was collected.

**Results:** A total of 30 both symptomatic and asymptomatic LOVA patients with a mean fronto-occipital horn ratio (FOHR) of 0.49 (SD +/-0.06) were included. The mean age was 47.9 years (SD +/-16.8). On imaging, Aqueduct stenosis was present in 18 patients (60%). 10 (33%) and 8 (27%) out of 30 patients were found to have an above average verbal intelligence quotient (IQ) and a performance IQ respectively. No significant correlation (p 0.42) was found between FOHR and IQ in t-test. Only two patients (6.7%) were unemployed. On focal testing 3 out of 7 patients with the highest IQ showed executive function impairment and slow speed of processing. The exact neurocognitive profile is yet to be completed. To date, a comparison between pre- and post-surgery could be drawn in 3 patients, with 7 additional patients expected to have imminently complete data.

**Conclusions:** A wide variability in terms of cognition was observed in patients with ventriculomegaly that could mirror the normal distribution in the general population, concluding that ventriculomegaly should not automatically be associated with cognitive dysfunction.

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## Spine

Oral presentation

Craniocervical junction injuries: a systematic review of recommendations, guidelines and consensus statements

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### Objectives:

- Identify and critically evaluate published recommendations, guidelines, and consensus statements regarding the assessment, diagnosis, and management of the CCJ injuries
- Develop a flow chart algorithm for the management of CCJ injuries, based on the best available clinical evidence and expert consensus

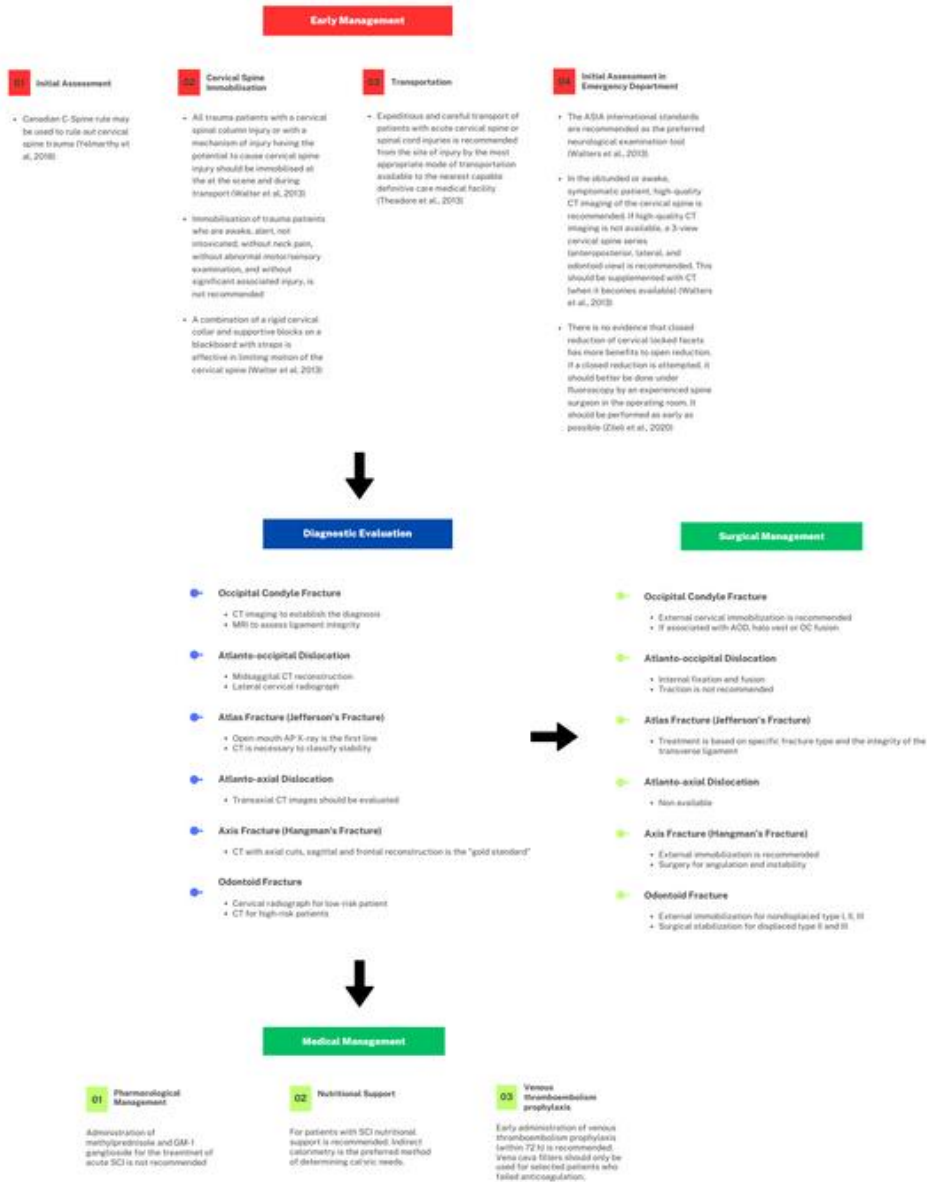
**Background:** Craniocervical junction (CCJ) injuries are a type of traumatic injury to the cervical spine that are rare but clinically significant. These injuries include a range of pathologies such as fractures, dislocations, and combined injuries involving the occipital condyle, C1, C2, and odontoid process. Due to their rarity and complexity, the management of CCJ injuries can vary widely and remains an area of active debate and controversy.

**Methods:** A comprehensive search of three databases (PubMed, Scopus, Ovid) was conducted to identify any guidelines, consensus statements, or recommendations published between 1st January 2000 and 31st December 2021. The results of the search were reviewed by two independent medical doctors in accordance with the PRISMA guidelines. Recommendations made by a single research group or an institution were excluded. A total of eleven relevant studies were selected for analysis.

**Results:** The selected studies addressed various aspects of CCJ injuries, including pre-hospital management, assessment in the emergency department, diagnostic evaluation, and management. Although the studies had many similar recommendations, there were some nuanced differences in areas such as cervical spinal immobilisation, closed reduction, radiological measurements, and surgical approaches. We summarised the recommendations in a table format and developed a comprehensive management algorithm (\*an extract from the flow chart is shown in Figure 1)



## Management Pathway for CCJ Injuries



**Conclusions:** We highlighted the complexity of managing CCJ injuries and the importance of adopting a standardised approach to diagnosis and management. By providing a summary of published guidelines and recommendations, we aim to assist neurosurgical teams in making informed decisions about managing CCJ injuries.

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## Global Neurosurgery

Oral presentation

### Feasibility and acceptability study of double fortified salt with iodine and folic acid: pilot clinical study

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**Objectives:** The objective of this pilot pre/post-test clinical study is to assess feasibility, acceptability, and directional signal of effect of double fortified iodized salt with folic acid (DFIS) on serum blood folate levels of women of reproductive age in the USA.

**Background:** Neural tube defects are serious birth defects occurring ~28<sup>th</sup> day post-conception. Folic acid fortification (FAF) of wheat, maize and rice showed reductions in prevalence of these birth defects in several countries. We examined the potential for salt to serve as a vehicle for FAF.

**Methods:** Women ages 18-45 received a DFIS saltshaker to use for 30 days instead of regular table salt. *Feasibility* was measured by

- 1) consent rate
- 2) completion rates of study visits, dietary and lifestyle surveys.

*Acceptability* was measured by

- 1) completion rate of daily salt logs
- 2) consumption of salt by weighing saltshakers
- 3) attitude towards taste and color.

*Dietary surveys* were collected to document dietary folate intake. Baseline and 1-month serum folate levels were estimated.

**Results:** A total of 32 women (100% enrollment) were enrolled in the study (11-non-Hispanic White, 11-non-Hispanic Black, 10-Hispanic). Feasibility: 100% consent rate, 100% completion study visits. Acceptability: 100% completion of daily salt logs, varied consumption of DFIS; 96.7% and 90% responded that taste and color of salt are highly acceptable. Average increase of 8.2% in serum blood folate per 1 gram of salt in 28 (88%) women is statistically significant in pre/post comparison ( $p < 0.001$ ). Secondary findings showed high level of folate insufficiency at baseline (44%) in a country that already implements flour folic acid fortification. More black women were insufficient than other races. Hispanic women consumed the least amount of folate from diet.

**Conclusions:** This novel study of DFIS shows promise in feasibility, acceptability and significant effect on blood folate in sample population. Larger sample and currently non-fortifying site are warranted for next project.

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## Paediatric

Oral presentation

Our first experiences with endoscopic-assisted suturectomy with subsequent therapy with cranial remodeling orthosis as a treatment of craniosynostosis

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**Objectives:** To treat craniosynostosis with endoscopic-assisted suturectomy with subsequent therapy with cranial remodeling orthosis.

**Background:** The surgical treatment of craniosynostosis has been gradually developing since 1890. The endoscopic-assisted suturectomy of the affected sutures, followed by varying lengths of therapy with cranial remodeling orthosis, is already widely accepted.

**Methods:** We retrospectively evaluated the cohort of the first 14 children (2019-2022) with craniosynostosis treated by endoscopic-assisted technique followed by a cranial remodeling orthosis application. There were six children with sagittal synostosis, two with bilateral and one with unilateral coronal synostosis, three with metopic synostosis, and two with unilateral frontosphenoidal suture synostosis. We performed the scan for the orthosis within a week after the surgery, so the therapy with the orthosis started within two weeks after the surgery at the latest.

**Results:** The average age of the child at the time of the surgery was 5,7 months (4,0-8,5), weight was 7,3 kg (5,9-8,5), the average operative time was 92 minutes (50-140), two children (14%) received a blood transfusion during the procedure. The average length of hospital stay was 4,1 days (3-6), and the duration of wearing the orthosis was 8,7 months (7-11). We did not convert any procedure to an open approach and did not notice complications in any child during hospitalization. All children tolerated wearing the orthosis well. The cosmetic correction of the shape of the head was evaluated as satisfactory by both the parents and the neurosurgeon after the end of orthosis therapy in all children.

**Conclusions:** Endoscopic-assisted suturectomy followed by cranial remodeling orthosis therapy is becoming a standard method of treating craniosynostosis. Proper indication and timing of performance are essential.

## Oncology

ePoster presentation

### Modified Poppen's approach for pineal region lesions: indications, technical nuances and outcomes

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**Objectives:** To study the indications and extent of resection using Poppens approach for pineal region tumors. To assess the morbidity associated with the procedure.

**Background:** Pineal region lesions are managed by various surgical options, including endoscopy, microsurgery and stereotactic biopsy. The utility and outcome of modified Poppen's ( occipital transtentorial approach) approach in surgical management of these tumors in our Institute were analysed.

**Methods:** The details of all patients who underwent modified Poppen's approach for pineal region lesions were retrieved from the department registry. The clinical details, surgical procedure details, post operative outcomes were tabulated from case records. Extent of resection was noted from the post-operative images.

**Results:** Twenty three patients underwent modified Poppen's approach in our Institute from 2016 till 2022. The age ranged from 9 – 69 years. Eighteen patients had features of raised ICP at presentation. Eighteen patients had right sided approach and five had left sided approach. Gross / near total resection was possible in 10 patients( 43.5%). Two patients developed hemiparesis post-operatively. Two patients developed worsening of upgaze restriction. One patient had left occipital hematoma causing difficulty in recognition of objects and color which gradually improved. One patient required VP shunt for hydrocephalus and another required thecoperitoneal shunt for pseudomeningocele. There was no operative mortality in this cohort. Histopathological examination revealed pineal parenchymal tumors were the most common ( 6/23), followed by meningioma ( 6/23), germ cell tumors ( 2/23), papillary tumor of pineal region ( 2/23), epidermoid ( 2/23).

**Conclusions:** Modified Poppen's approach is a safe surgical approach for pineal region tumors which can result in near / gross total resection in 43.5% patients. Imaging features of non-germ cell tumors and large tumors causing raised ICP can aid the surgeon in decision making for tumor decompression and plan further management.

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## Paediatric

ePoster presentation

Case report: complete resection of a primary intraosseous meningioma in a 15 years old boy in Mexico, a rare entity

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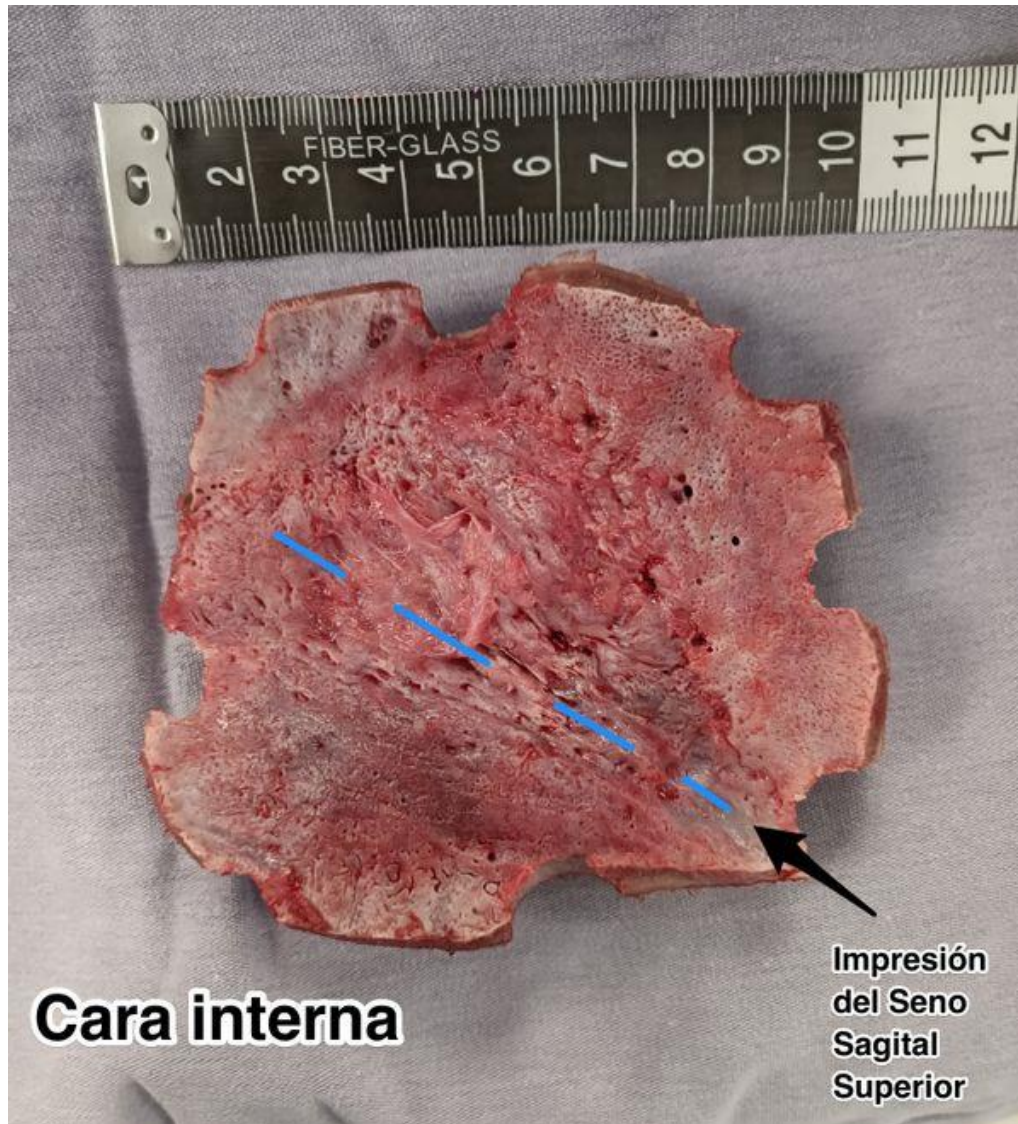
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**Objectives:** To highlight a rare case of a primary transitional intraosseous meningioma in pediatric population, without any known background of NF, radiation, nor family history, since this type of location makes up to 2% of overall meningiomas and it is even more rare in pediatrics as isolated cases

**Background:** A 15 years old male patient came to office consultation due to a history of mild intellectual disability, seizures and an obvious left frontoparietal bone tumor covered with healthy scalp in order to evaluate surgical excision. The CT revealed a pure intraosseous tumor of up to 35 mm thick, and a 10\*9 cm long, slightly left sided in the frontoparietal junction that crossed the midline over the SSS and caused significant subjacent brain edema.

**Methods:** We performed a centered Souttar skin incision in order to expose the exophytic visible extension of the affected bones, performed multiple drills around the tumor and blocked them with bone wax. After cautiously dissecting the epidural space, being specially gentle with the midline, we removed all the tumor en bloc and proceed to control the profuse haemorrhage with haemosthatic sponge, compression and suction. Subsequently we placed a titanium mesh and finished the procedure with a blood loss of 400 cc and the patient was discharged the day after.



**Results:** The patient came 2 months later to office with a good cosmetic outcome, his speech was slightly more fluent and just suffered one single seizure a week after discharge. The pathology department reported a transitional intraosseous meningioma (WHO Grade I) with disease-free margins.

**Conclusions:** Primary intraosseous meningiomas are rare, even more so in pediatric population, it is important to highlight this entity and always bear in mind different differential diagnoses such as Osteoma, fibrous dysplasia, osteoblastic skull metastasis, Paget disease among others.

## Functional

Oral presentation

### Stepwise dual targets lesioning in a single procedure for the tremor and akinesia in mixed-type Parkinson's disease

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**Objectives:** Stepwise dual targeting lesion of the cerebellothalamic tract (ctt) and pallidothalamic tract (ptt) to abolish all motor symptoms in parkinson's disease (PD).

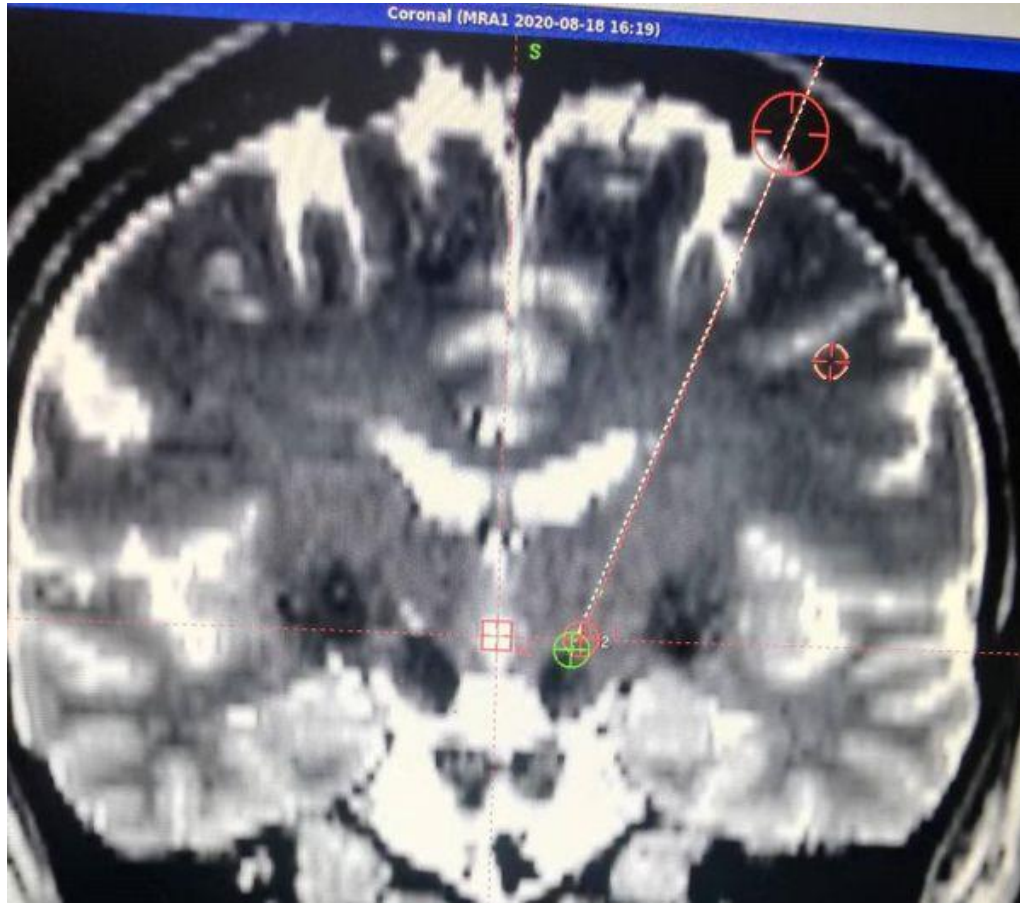
**Background:** Targeting the ctt and ventral intermediate nucleus (VIM) can abolish tremor and alleviate rigidity, but has no effect on akinesia; whereas targeting the ptt can improve bradykinesia and rigidity, but doesn't always has satisfying result for tremor; therefore, combination of two targets lesioning, i.e., stepwise to lesion ctt at inferior aspect of thalamus and ptt at Forel's H field in which contains globus pallidus internus projecting fibers to thalamus and pedunculopontine nucleus, will improve all motor symptoms of mixed-type PD.

**Methods:** 10 mixed-type PD were enrolled in this pilot study, of those 5 underwent unilateral lesioning and 5 staged bilateral lesioning. The Unified Parkinson's Disease Rating Scale (UPDRS) part III was used to evaluate the results of 15 unilateral procedures, as well as compare the scores after second surgery with after first surgery and before first surgery in 5 staged bilateral procedures. The complications and the subjective impressions of patients were also analyzed.

**Results:** UPDRS scores significantly reduced after operation, the more significantly after bilateral surgery. In all 15 treated side, tremor completely disappeared, akinesia, rigidity, gait and posture significantly improved when compared with before operation ( $p < 0.001$ ), and the improvement maintained stable up to the last follow-up of 6 to 50 months. The levodopa equivalent daily dose was significantly reduced, and 3 patients stopped medication. 2 patients experienced two-days transient dyskinesia, and 1 had a three-days transient worsening speech difficulty, which all occurred in first week after operation, no other obvious adverse effects were reported. All patients were satisfied with their results.

**Conclusions:** Stepwise dual radiofrequency lesions of ctt and ptt improve Contralateral side overall PD symptoms, and the staged bilaterally lesioning is feasible without noticeable permanent complications.







## Paediatric

Oral presentation

### Transition of hydrocephalus patients from paediatric to adult neurosurgery: a single institution experience

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**Objectives:** Describe the needs of former paediatric hydrocephalus patients post transition.

**Background:** The transition process from paediatric to adult neurosurgery is an essential part of patient's care. This study aims to report our institution's experience and obtain information about this patient subgroup.

**Methods:** This is a single centre retrospective case series study. Data regarding current age, hydrocephalus etiology, number of shunt revisions in childhood and after transition, type of presentation (acute vs routine follow up), type of valve, length of follow up and outcome (including school attendance, highest degree, work and living conditions, mRS, Karnofsky and HUI index) was collected.

**Results:** from the nearest paediatric center, Great Ormond Street Hospital (GOSH); 105 from other national and international hospitals. Common hydrocephalus etiologies were: post haemorrhagic 19.8%, Chiari type 2 12.7%, Aqueduct stenosis 12.7%, congenital 8.81%, post infectious 7% and tumor 5.2%. Hydrocephalus following hemispherectomy, syndromic craniosynostosis or idiopathic intracranial hypertension was rare. In 16.7% (38 cases) no cause could be identified, due to insufficient documentation. 171 (75.3%) presented electively, whilst 37 (16.2%) were referred with suspicion of acute shunt dysfunction without being transitioned. 19 (8.3%) were lost to follow up. Patients presenting acutely were more likely to come from other centers 28/105 (26.7%) compared to 9/122 (7.37%) GOSH ( $p < 0.005$ ; Wilcoxon Signed Rank). 69/227 (30%) patients underwent at least a CSF diversion intervention in adulthood. 16/21 (76%) conservatively followed up cases required surgery in adulthood. Outcome data was collected from 108 patients. Significant sequelae such as headaches and fatigue remain persistent in up to 70% regardless of hydrocephalus etiology with just around a half of the patients being able to have a fully independent life.

**Conclusions:** Hydrocephalus is a condition that requires lifelong neurosurgical follow up. A more structural approach towards transition is needed.

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## Epilepsy

ePoster presentation

Intractable seizures secondary to a sub centimetric cortical dysplasia in the hand area of the motor cortex: management strategies

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### Objectives:

- Feasibility of resecting an epileptogenic lesion located in the eloquent cortex.
- How to reduce postoperative deficits and improve seizure outcome.

**Background:** Focal cortical dysplasia (FCD) constitutes 5-25% of lesional epilepsy and can cause intractable seizures. Resection of lesions located in the sensory-motor cortices is challenging.

We present a case of a 12-year-old boy with FCD located in the hand area of the right motor cortex causing daily seizure episodes. The pre-operative evaluation, surgical strategy, and short-term outcome are discussed.

**Methods:** Our surgical epilepsy unit reports a case of a child suffering from intractable seizures with a lesion located at his hand area of the right motor cortex. After a presurgical evaluation including video electroencephalography (EEG) and intraoperative cortical mapping, using electrical cortical stimulation (ECS) the patient's lesion was removed without any major neurological deficits.

**Results:** Post-operatively child's seizure frequency was reduced to 1-2 per week with left-hand grade 4 weakness, which was improved later.

**Conclusions:** FCD-causing intractable seizures in the motor cortex need thorough preoperative evaluation using video EEG and resection with the help of intraoperative adjuncts like Navigation, Intraoperative Ultra sonogram, and intraoperative electrical cortical stimulation. This will reduce postoperative deficits and result in a good outcome.

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## Paediatric

Oral presentation

### Neurocognitive and endocrinological outcomes following treatment in children with craniopharyngioma

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#### Objectives:

1. To evaluate the quality of life functions in children with craniopharyngioma following surgery and adjuvant therapy.
2. To evaluate the impact of craniopharyngioma and their treatment on the endocrinological and neurocognitive profile.

**Background:** Very little information exists on quality of life (QoL) and neurocognitive functions in Indian context specifically in the pediatric population with craniopharyngioma.

**Methods:** All children (aged between 1 years to 18 years) who underwent surgical treatment for craniopharyngioma from the year January 2010 till November 2019 at the National Institute of Mental Health and Neurosciences (NIMHANS), Bengaluru with minimal 1 year follow up were included in the study and prospectively assessed. Endocrinological outcome were assessed using hormonal evaluation. Patients underwent HR-QoL and Cognitive function evaluation using Pediatric quality of life Inventory (PedsQL) questionnaire. The neurocognitive evaluation was done by clinical psychologist.

**Results:** Our study included 47 children with craniopharyngioma. In our study normal vision was noted in 38.3% children at presentation which significantly improved to 63.8% at present evaluation. 68.1% required some hormonal replacement at the time of follow up. Thirty six children attended school following completion of treatment. It demonstrated that a good number of children get back to school after completion of treatment in most cases. Overall QoL scores, both as per child and parent-reported scores are above median values. 24 children underwent neuropsychology assessment. Out of 24 children, 17 children had average and above average intelligence while 7 children demonstrated below average intelligence.

**Conclusions:** A good proportion of the children in our study demonstrated hormonal deficiency at the last follow up requiring replacement. Overall QoL scores, are above median values. Overall scores across all age groups for cognitive functioning was on the higher side, but still patients with recurrence and abnormal vision had low cognitive functioning.

## Neurovascular Surgery

Oral presentation

Additional artery territory infarction in malignant middle cerebral artery stroke does not worsen the prognostic of patients undergoing decompressive hemicraniectomy

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**Objectives:** To compare the outcome of patients with or without additional artery territory infarction in malignant middle cerebral artery (MCA) stroke undergoing decompressive hemicraniectomy.

**Background:** Decompressive hemicraniectomy is a proven intervention to reduce mortality and disability after malignant MCA stroke. However, it is unclear whether patients with other artery territory infarction (posterior or anterior cerebral artery) may benefit as well.

**Methods:** This is a monocentric retrospective cohort of patients with malignant MCA stroke who underwent decompressive hemicraniectomy from 2012 to 2022. Surgical procedure was performed by the same team, following current protocols. Medical records were retrieved to collect clinical data (sex, age, admission NIHSS, GCS, time from ictus to surgery, diabetes, arterial hypertension, smoking), computed tomography (CT) scans, and outcome at 90 days after the surgery. Besides, a volumetric approach of stroke volume was performed using the ITK-SNAP software (v.3.8.0).

**Results:** We included 86 patients (55.8% male) with mean age of  $57.4 \pm 13,2$  years. Median admission NIHSS score was 18 (interquartile range: 6), and GCS 10 (IQR: 5), and mean infarction volume was  $309.1 \pm 100.2$  ml. Patients with additional territory infarction had high admission values of NIHSS, GCS, and infarction volume. The other clinical data were not different between the two groups. With regards to outcome, there was no difference on the rate of death at 90 days follow-up (32% vs 32.8% for patients with and without additional territory, respectively -  $p = 0.944$ ). Similarly, severe disability (i.e., modified Rankin scale score  $> 3$ ) was not different between the groups (83.6% vs 88.0% for patient w/ and w/o additional territory, respectively  $p = 0.748$ ).

**Conclusions:** The 90-days outcome of patients with malignant MCA stroke with other artery territory infarction is not different from those without additional territory. Therefore, the presence of additional territory may not be an exclusion criteria on selecting patients for decompressive hemicraniectomy.

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## Epilepsy

ePoster presentation

### Long-term seizure outcomes and relapse rates after different types of resective pediatric temporal lobe epilepsy surgery

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**Objectives:** We evaluated both short- and long-term seizure outcomes including relapse rates after three different surgical approaches in children and adolescents with pharmaco-resistant TLE to determine optimal resection strategies.

**Background:** Epilepsy surgery is an effective curative treatment option for pharmaco-resistant temporal lobe epilepsy (TLE) in children. However, the extent of resection remains controversial, especially when considering the potentially higher risk of larger surgeries.

**Methods:** We performed an analysis of prospectively collected data of pediatric TLE surgery patients at our institution. Minimum follow-up (FU) was three years after surgery.

Resections were re-evaluated and stratified into lesionectomy, anterior temporal lobectomy (TLR) and selective amygdalahippocampectomies (SAHE). Ongoing seizures and seizure relapses within the first three years were considered as surgical failure.

**Results:** A total of 97 patients were included following 31 lesionectomies, 53 TLR and 13 SAHE between 1993 and 2019. Histological diagnosis most frequently revealed epilepsy associated tumors (45.4%), hippocampal sclerosis (37.1%) and focal cortical dysplasias (13.4%). One year after surgery, seizure outcome was ILAE class 1a and 1 in 70.1%, increasing to 77.5% after 5 years and 73.3% after 10 years. At the last FU (median 10.4 years, range 3.0 to 28) 76.3% were seizure free. Seizure freedom after one year was lower following SAHE compared to lesionectomies and TLR. Consequently, TLR had the lowest odds for surgical failure. Seizure relapses occurred in 25.8% of patients. Reoperations were performed in 16 patients (16.5%). Preoperative generalized seizures increased the likelihood seizure relapses.

**Conclusions:** Pediatric patients with intractable TLE undergoing surgery have a high chance of long lasting favourable seizure outcomes. Resection strategy appears to be an important prognostic factor for early surgical success, and in favor of larger resections. Larger resections might be a safer option when additional surgery cannot be offered easily or when patient and caregiver compliance is low.

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## Oncology

ePoster presentation

### Metastasis or meningioma?

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#### Objectives:

- 1. Describe approach to a cystic lesion in a geriatric patient
- 2. Discuss the occurrence of cystic meningiomas in this age group
- 3. Review literature on adult cystic meningiomas

**Background:** The cystic form of meningiomas is very rare with an incidence less than 1-7% and furthermore their occurrence in the elderly is seen infrequently. Radiology can be a misleading in preoperative diagnosis in such cases.

**Methods:** An 83yr male presented with gradually progressive memory disturbances, decreased mentation and urinary incontinence for 3 months. Possibility of metastasis was kept considering the age.

**Results:** Contrast MRI brain revealed a large cystic lesion with a small nodule at base, in right frontal parasagittal region, without any perilesional edema. The cyst wall was minimally enhancing, with dense heterogenous enhancement of solid component. Patient underwent right frontal parasagittal craniotomy with gross total resection of lesion. Histopathology revealed vascular tumor with thick-walled blood vessels, round to oval nuclei with abundant cytoplasm, all of which favour angiomatous meningioma grade I, which was further confirmed by IHC markers.

**Conclusions:** Cystic meningioma is an unusual histological variety of intracranial tumors but should be kept in mind in elderly population, when there is absence of perilesional edema. Cystic meningioma mimicked metastasis in this present case.

## Skull Base

ePoster presentation

### Evaluation of endoscopic trans-nasal trans-sphenoidal surgery of growth hormone-secreting tumor and related factors: a 15-year retrospective survey

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**Objectives:** This study aimed to evaluate the surgical results and prognostic factors of acromegaly in patients who underwent trans-nasal trans-sphenoidal surgery.

**Background:** Acromegaly has significant complications, including cardiovascular disease, respiratory, metabolic, malignancy, and musculoskeletal complications. Controlling the secretion of growth hormone (GH) and insulin-like growth factor-1 (IGF-1), reducing tumor growth, and maintaining pituitary hormone function are treatment goals.

**Methods:** 163 patients with acromegaly (microadenoma, n=33; macroadenoma, n=133) who underwent endoscopic transsphenoidal surgery between 2006 and 2019 were registered in Loghman Hakim Hospital. Demographics and radiological characteristics of the lesion, surgical complications and radiological recurrence of the lesion, and disease-related mortality and their relationship were analyzed.

**Results:** Remission was achieved in 103 (63.2%) patients. A statistically significant difference between left and right perimetry before and after surgery was also shown ( $P < 0.001$ ). Pre-operation, the highest and lowest frequency in left perimetry is related to temporal anopia and upper quadrant anopia and anopia with a prevalence of 17 (10.6%) and 7 (5.4%), respectively. There was a statistically significant difference in pre- and post-operation hypopituitarism ( $P < 0.001$ ). Before surgery, the highest and lowest frequency was associated with Gonads and thyroids, with a prevalence of 86 (52.8%) and 1 (0.6%), respectively. While after surgery, the number of thyroids reached 22 (13.5%). Post-operation complications also showed that 94 patients (57.7%) had transient diabetes insipidus (DI), and 63 patients (38.7%) had no complications. Also, 78 patients (48.8%) had a subtotal resection, 82 patients (51.2%) had disease recovery, and 60 patients (36.8%) had no improvement. The prolactin level significantly decreased by  $23.13 \pm 59.05$  after the operation ( $P < 0.001$ ). The amount of IGF1 decreased significantly after surgery by  $372.38 \pm 136.58$  ( $P < 0.001$ ). Also, the GH value decreased significantly after surgery by  $11.86 \pm 13.55$  ( $P < 0.001$ ).

**Conclusions:** Endoscopic transnasal transsphenoidal surgery for acromegaly showed a high recovery rate and low incidence of endocrine defects and complications.

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## Global Neurosurgery

Oral presentation

### Establishment of a global registry for traumatic brain injury – GEO-TBI

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#### **Objectives:**

To establish a global registry that will allow to benchmark local service against a global standard, identify unmet need in traumatic brain injury (TBI) care and progress its evidence-based prioritisation in policymaking.

**Background:** Global disparity exists in the patients at risk, type, management and outcomes of TBI. The mechanisms underlying these differences could be studied, using an international registry to map outcome differences. Establishing an accurate picture of the global TBI burden is a challenge requiring systematic ongoing data collection of TBI patients across all management modalities. We established the Global Epidemiology and Outcomes following Traumatic Brain Injury (GEO-TBI) registry to map TBI care worldwide.

**Methods:** The registry was developed in an iterative consensus-based manner by a panel of neurotrauma professionals. Proposed registry objectives, structure and data points were established in two international multi-disciplinary neurotrauma meetings, and a survey consisting of the proposed data points was circulated within the international TBI expert community. The survey results were disseminated in a final meeting to reach a consensus on the final registry variables.

**Results:** A total of 156 professionals from 53 countries including both HICs and LMICs responded to the survey. The final consensus-based registry includes TBI patients who required neurosurgical admission, a neurosurgical procedure, or a critical care admission. Currently, the registry contains data from 238 TBI patients from five countries, with more than 20 sites starting data collection. The dataset comprises clinically pertinent information on demographics, injury characteristics, imaging, treatments, and short-term outcomes.

**Conclusions:** The GEO-TBI registry enables high-quality data collection, clinical auditing and research projects. It is supported by the World Federation of Neurosurgical Societies (WFNS) and the National Institute of Health Research (NIHR) Global Health Programme. The registry (<https://geotbi.org>) is open for participant site recruitment. Any centre involved in TBI management is welcome to join the collaboration.



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## Global Neurosurgery

Oral presentation

Outcomes and practicality of subcutaneously implanted bone flaps in the abdominal wall following decompressive craniectomy and subsequent use in cranioplasty

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**Objectives:** Outcomes and practicality of subcutaneously implanted bone flaps in the abdominal wall following decompressive craniectomy and subsequent use in cranioplasty.

**Background:** Traumatic brain injury and stroke present a global health issue with a devastating sequela of raised intracranial pressure. Decompressive Craniectomy (DC) is utilized to treat elevated intracranial pressure. Cranioplasty following a DC is an inevitable operation. Autologous bone flaps are considered as the most ideal substitute for cranioplasty. Subcutaneous preservation of the autologous bone flap in the abdomen is a simple and affordable technique but presents controversies with no consensus on its validity. In this paper, we aim to share our experience with subcutaneous preservation of the bone flap and cranioplasty.

**Methods:** A retrospective review was conducted on all patients who underwent a DC with implantation of the bone flap in the abdominal subcutaneous tissue to investigate the outcome of bone preservation and associated outcomes following a subsequent cranioplasty from January 2018 to December 2022 at a tertiary-care center.

**Results:** 112 patients underwent a DC with implantation of the bone flap in the abdominal subcutaneous tissue. Excluding patients lost to follow up or expired, 46 patients were deemed eligible. Majority of the group recovered without complications following cranioplasty (81%). While 9 cases developed complications that required re-operation. They included 6 abdominal hematomas, 3 were infected, one case of subdural empyema, and one case of massive intracranial hemorrhage due to coagulaopathy requiring removal of the bone flap. Only 2 cases of bone resorption were noted which necessitated usage of an artificial graft for cranioplasty.

**Conclusions:** The practice of preserving bone flaps in the abdominal subcutaneous tissue after DC seems to be of relatively low risk and provides a practical method for a cranioplasty. While further studies are needed to determine its cost effectiveness, it poses a low risk warranting routine use for most patients.

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## Peripheral

Oral presentation

Possible donor nerves for axillary nerve reconstruction in dual neurotization for restoring shoulder abduction in BPI: systematic review and meta-analysis

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**Objectives:** Restoring shoulder abduction is one of the main priorities in the surgical treatment of brachial plexus injury. Double nerve transfer of donor nerves to the axillary nerve and suprascapular nerve is most promising method. The most common donor nerve for the suprascapular nerve is the spinal accessory nerve. However, donor nerves for the axillary nerve vary across studies.

**Background:** The aim of this study was to perform a systematic review on reconstructions of axillary nerve and to perform a meta-analysis investigating the outcomes the use of different donor nerves on axillary nerve reconstructions.

**Methods:** We conducted a systematic search of English literature following PRISMA guidelines. Two outcomes were assessed, abduction strength (MRC) and range of motion (ROM). Twenty-two studies met the inclusion criteria for the systematic review. Donor nerves investigated included the radial nerve, intercostal nerves, medial pectoral nerve, ulnar nerve fascicle, median nerve fascicle and the lower subscapular nerve. Fifteen studies that investigated the radial and intercostal nerves met the inclusion criteria for a meta-analysis.

**Results:** We found no statistically significant difference between either of these nerves in the abduction strength in MRC score (radial nerve  $3.66 \pm 1.02$  vs intercostal nerves  $3.48 \pm 0.64$ ,  $p=0.086$ ). However, the difference in ROM was statistically significant (radial nerve  $106.33 \pm 39.01$  vs. intercostal nerve  $80.42 \pm 24.9$ ,  $p<0.001$ ).

**Conclusions:** Our findings support using the radial nerve as a donor for axillary nerve reconstruction when possible. Other promising methods need to be studied more in order to validate and compare results with widely used methods.

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## Skull Base

### ePoster presentation

Lateral skull base approaches for Trigeminal Schwannomas in the era of endoscopic approaches

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**Objectives:** Trigeminal schwannomas (TS) are the second most common type of schwannomas of skull base. Some of the rarest TS are found in the peripheral extradural regions of the pterygopalatine and intratemporal fossa, with the various amount of middle fossa and cavernous sinus involvement. The endoscopic endonasal and transmaxillar approaches are among the most preferable minimally invasive approaches for TS resection in this area.

**Background:** The endoscopic endonasal and transmaxillar approaches are among the most preferable minimally invasive approaches for TS resection in this area.

**Methods:** Two patients with suspected trigeminal schwannomas located in the pterygopalatine fossa and intratemporal fossa, originating from second and third trigeminal branches were referred for surgery to our center. Both tumors were surgically resected through the lateral trans-zygomatic, trans-basal (reverse lateral skull base) approach. The goal of both surgeries was radical gross total resection together with middle fossa involvement. Both procedures were uneventfully performed within 180 minutes. There were not any peroperative or postoperative complications including CSF leak or meningitis.

**Results:** Clinical and radiological evaluation of both patients performed after one-year revealed no residual tumor or local recurrence. The patients are without any new neurological deficit, wound healing problem or mastication issues.

**Conclusions:** The mastered lateral transbasal approaches are the still an integral part of multidisciplinary treatment of trigeminal schwannomas with dominant peripheral extradural propagation. These approaches offer straight, fast, safe and radical resection of these benign skull base tumors with minimal morbidity.

## Trauma

### ePoster presentation

Retrospective study of operated case of chronic subdural hematomas in Mauritius and outcome depending on the different operative techniques

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**Objectives:** To optimize management of cSDH in relation to cost effectiveness and outcome so as to model an appropriate framework for operative management.

**Background:** Incidence of chronic subdural hematomas (cSDH) are increasing worldwide and in Mauritius with the increased aging population and anticoagulant use. Line of management includes: different surgical, medical, and endovascular treatments with varying success rates. Neurosurgical interventions include burrhole drainage (single or double), large craniotomies and mini-craniotomies with or without fenestration of membrane. Key assessment of the success of cSDH treatments has been symptomatic recurrence rate (5 to 30%).

**Methods:** Consecutive craniotomies for cSDH evacuation performed by a single neurosurgeon at our main Neurosurgical Center in Mauritius from April 2017 - January 2023 were retrospectively reviewed. Patient characteristics [age, gender, GCS, initial CTs noting the inner subdural membrane, midline shift (MLS), width, membrane fenestration, recurrence, post-operative seizures, infections, length of stay] were retrieved. Furthermore, GOSE rating, EQ-SD-SL utility index and mini mental status were evaluated as outpatient at six months interval.

**Results:** 86 patients had craniotomies as primary treatment of the cSDH; out of which 2 was single burrhole craniotomy, two burrholes technique was 18; large fronto-temporo-parieto-occipital craniotomies and mini-craniotomies were respectively 36 and 30. Mean age = 66 years, mean pre-operative GCS = 12, mean MLS = 18 mm, and mean maximum thickness of cSDH = 17 mm. 72 were unilateral, 14 bilateral. 76 had inner membrane signs on pre-operative head CTs and fenestration of inner membrane was carried out in 84 cases. Radiographic and clinical improvement occurred in all patients. There were 22 symptomatic recurrences, 26 re-operations, 18 surgical site infections, or 16 deaths during the 6 months of follow-up.

**Conclusions:** Mini-craniotomy with careful fenestration of the inner membrane has proven to be more effective in our study with best result of wound healing, complication and lesser recurrence rate.

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## Spine

### Oral presentation

Anterior odontoid screw fixation following type II and shallow type III fracture - Hounsfield unit prediction protocol of fusion rates

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**Objectives:** Main objective of this study was to determine whether Hounsfield units (HU) measured in the watershed area of the axis correlate with successful fusion in patients with type II and shallow type III C2 fractures undergoing anterior odontoid screw osteosynthesis (AOSF).

**Background:** In the first retrospective part of study 45 patients treated via AOSF were analyzed. Only bony fusion with bone trabeculations across the fracture line was considered a successful result. Preoperative HU values were measured in three zones- corpus, watershed and dens. Statistical analysis was performed to determine significant differences between HU of fused and unfused patients in all three zones of a complete and adjusted patient cohort.

**Methods:** In the prospective part of study, the new acquired protocol based on high bone quality (HU >300) in the watershed area was applied on 17 consecutive patients.

**Results:** Statistically significant differences of HU values were retrospectively found between fused (corpus- 363.7, watershed- 327.9) and unfused (corpus- 279.5, watershed- 194.2) of the complete cohort and the adjusted cohort. Cut-off HU values in the watershed zone were calculated for the complete (250 and 300) and adjusted cohort (240 and 260), dividing patients into three groups of bone quality. Patients with high watershed bone quality (HU >300) achieved successful fusion in 84.62%, patients with low bone quality (HU <250) in 3.85%. In the prospective part of study, five patients with low bone quality were indicated for posterior C1-2 fusion with 100% fusion rate. Nine patients with high bone density were indicated for AOSF. In this group 7 of 9 patients with one year follow up fused. The fusion rate of AOSF changed from 36% to 88%.

**Conclusions:** Preoperative measurement of HU can be used to predict the probability of successful fusion in patients undergoing AOSF for type II and shallow type III C2 fractures.

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## Global Neurosurgery

Oral presentation

The status of ventricular and skull base endoscopy in Latin America and Portuguese or Spanish-speaking African countries

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**Objectives:** To map the current situation of the use of ventricular and skull base neuroendoscopy in Latin America and in Portuguese or Spanish speaking African countries to provide a substrate for global neurosurgery actions.

**Background:**

Hydrocephalus is one of the most common entities in the daily practice of neurosurgeons and, in some countries, access to a simple ventriculoperitoneal shunt system is extremely difficult. Pituitary tumors are also common lesions that require specialized treatment. Both ventricular and skull base endoscopic surgeries can meet the need for treatment of certain places. However, the necessary equipment and training in neuroendoscopy is not always available.

**Methods:** We prepared a questionnaire with 50 questions to understand the use of ventricular and skull base endoscopic techniques in each hospital and the needs of each neurosurgery team. The questionnaire was sent exclusively to neurosurgeons through social media within a period of 3 weeks.

**Results:** We obtained 194 responses representing hospitals from 22 out of 25 countries included in the project. In 2 countries there is currently no Neurosurgeon.

Ventricular endoscopy is performed in 88,1% of hospitals and skull base endoscopy in 71,6%.

Ventricular and skull base endoscopy are not performed in 23 and 55 hospitals, respectively, and there is no other hospital offering endoscopic treatment in the same region in 69,5% and 78,2% of the cases. The main reason given was lack of training, followed by the need for specific materials. There are neurosurgeons interested in specialized training in 97,5% of these hospitals.

We found 23 teams specialized in ventricular endoscopy and 36 in skull base endoscopy that perform more than 50 cases per year and are interested in receiving fellows.

**Conclusions:** We mapped regions lacking neuroendoscopy and regions with structure to receive neurosurgeons in training. Actions can be taken to connect neurosurgeons who share the same language and/or close location.

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## Oncology

ePoster presentation

From DICOM to perfect fit: customized PMMA cranioplasty implant design in skull invading tumors using 3D printing technique

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**Objectives:** This study aims to present a contemporary, cost-effective technique for producing customized polymethylmethacrylate (PMMA) cranioplasty implants using prefabricated 3D printed molds, focusing specifically on their application in skull-invading tumors. By employing this method, we strive to achieve anatomical precision while mitigating the inherent financial burdens associated with prefabricated customized cranioplasty implants.

**Background:** Neurosurgical advancements in cranioplasty for skull-invading tumors require cost-effective solutions. Customized 3D printed molds offer anatomical accuracy while reducing expenses associated with traditional implants. This study explores their application, bridging the gap between affordability and precision in cranial defect reconstruction.

**Methods:** Utilizing head CT scan images, we reconstructed cranial defects using advanced 3D editing software, enabling precise visualization of the affected area. Subsequently, we employed a low-cost polylactic acid 3D printer to generate a cranioplasty mold based on the external surface of the reconstructed cranial defect. Following sterilization and containment within a sterile bag, the mold was deployed intraoperatively to cast a customized PMMA implant.

**Results:** The implementation of customized polylactic acid (PLA) mold 3D printed cranioplasty demonstrated remarkable cosmetic outcomes, as confirmed by postoperative CT scans illustrating the restoration of cranial symmetry. These findings underscore the efficacy and aesthetic superiority of this technique.

**Conclusions:** The utilization of prefabricated 3D printed molds to produce customized PMMA cranioplasty implants emerges as a cost-effective approach for the delayed reconstruction of diverse cranial defects, especially in the context of skull-invading tumors. This innovative method offers unparalleled anatomical accuracy while circumventing the financial constraints typically associated with conventional, manually shaped acrylic implants. By harnessing the advancements in 3D printing technology, we empower neurosurgeons with a practical and accessible solution for optimizing surgical outcomes in patients requiring cranioplasty procedures.

## Neurovascular Surgery

Oral presentation

Emergent microsurgery in acute stroke patients after intravenous thrombolysis and mechanical thrombectomy failures: systematic review

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**Objectives:** The aim of this systematic review is to verify the safety and efficacy of microsurgical embolectomy and extracranial-intracranial bypass as a third-line treatment in cases of an emergent intracranial large vessel occlusion after failure of standard treatment.

**Background:** Intravenous thrombolysis and mechanical thrombectomy represent a therapeutical standard in the treatment of an emergent large vessel occlusion in stroke patients. Despite the development of new endovascular devices, on average 10% of patients fail to achieve recanalization. Persistent occlusion of a large vessel is associated with poor outcome. Current guidelines do not offer other revascularization options for these patients.

**Methods:** We extensively searched eight sources of published and unpublished literature. We performed independently by two reviewers titles, abstracts, and full texts analyses. Then we performed critical appraisal and data extraction from selected studies using the standardised tools. We narratively synthesised the findings from the included studies.

**Results:** The search identified eight relevant articles including a total of 12 patients with emergent large vessel occlusion (carotid terminus or middle cerebral artery) with standard treatment failure who underwent microsurgery within 24 hours from symptoms onset. Microsurgical embolectomy was performed in four cases (33%), extracranial-intracranial bypass in five cases (42%), their combination in two cases (16%) and manipulative intraoperative recanalization in one case (8%). NIHSS ranged pre-operatively from 7 to 25 points and postoperatively (1-7 days after surgery) from 1 to 18 points. Functional independence (modified Rankin Scale 0-2) was achieved in nine patients (75%) at a 3-12 months after surgery evaluation interval. No haemorrhagic complications neither after IVT nor after surgery were recorded. The only complication associated with the surgery was wound necrosis in 1 case (8%).

**Conclusions:** Microsurgical embolectomy and extracranial-intracranial bypass are safe and potentially effective third-line treatments for selected patients with emergent occlusion of large vessels in the anterior cerebral circulation.



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## Oncology

ePoster presentation

### Immunotherapy for glioblastoma: evolution from the bench to bedside and future promising frontiers

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#### **Objectives:**

The last decade has seen a plethora of FDA approvals for immunotherapies against solid tumors, yet glioblastoma remains a prominent setback. Despite more than 4 decades of work with a wide range of immunotherapeutic modalities targeting glioblastoma, efficacy has been challenging to obtain. Earlier forms of immune-based platforms have now given way to more current approaches, including chimeric antigen receptor T-cells, personalized neoantigen vaccines, oncolytic viruses, and checkpoint blockade. The recent experiences with each, our own experience with some of the agents as well as the latest developments and anticipated challenges, are reviewed.

#### **Background:**

Immunotherapeutic modalities for GBM and other cancers now run the gamut, ranging from antibodies to adoptive cell transfers to vaccines to virally based treatments to immune checkpoint blockade. The current status for many of these will be reviewed, with a focus on T-cell – based platforms.

**Methods:** Literature review, systematic searches of the MEDLINE and ClinicalTrials.gov databases, electronic clinical research data base analysis and our own experiences with few of the agents (currently undergoing phase -3 trials) will be discussed.

**Results:** The rapid pace of discovery in cancer biology has expanded therapeutic options for patients with brain tumors. Neurooncologists no longer need to prescribe the same regimen for all patients but instead can design customized therapies based on the molecular profile, imaging features, and clinical behavior of individual tumors. Moreover, the role of each modality in the treatment plan must be reviewed in light of current evidence.

**Conclusions:** Replication- competent oncolytic viruses (OVs) and gene therapy viral vectors are most promising newer agents. Current clinical applications of these viruses are typically delivered into the tumor or resection cavity by stereotactic injection. Immune check point agents (anti PD-1), glutamate modulator (BHV-4157), MR guided focus ultrasound and Adoptive lymphocyte transfers (CART cells- EGFRvIII, IL13RL2, HER-2) also have promising outcomes and should be subjected to larger trials.

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## Global Neurosurgery

ePoster presentation

Personal experiences from voluntary educational projects in Central Asia

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**Objectives:** Balancing act between high-end and basic neurosurgery.

**Background:** While some part of the world is neurosurgically well supplied, other parts are developing with a clear need for cooperation projects. I was lucky to receive one of the most valuable neurosurgical trainings (by Prof. Samii and Prof. Krauss) in Hannover, Germany. Later, I did projects around the world in several neurosurgical developing countries.

**Methods:** Voluntary projects with on site neurosurgical education is one the most fruitful ways. This is a report about challenges of translation the modern neurosurgery to basic conditions in lack of technology in Uzbekistan.

**Results:** Knowledge and skill transfer need a personal individual approach. Harmony between the meeting persons is of tremendous importance for quality and safety of the neurosurgical education. Personal capacity and local limitations have to be respected. Both parties will benefit from such projects. "Modern" neurosurgeon will benefit both personally also professional from such projects. One of the personal issues, working in the so-called third world is facing of the physician coming from so-called modern world with the basic problems of the patients and neurosurgeons in that countries. That can help adjusting the own topics in the mirror of "real" problems. Such reflection might clarify the own problems as virtual, not that existential? Neurosurgical benefit covers dealing with pathologic conditions which are not anymore available in the world of modern neurosurgery e.g. apple size benign tumors.

**Conclusions:** On site individual supervision of colleagues while developing their local neurosurgery is unavoidable. One will be rewarded with amazing thankfulness. Presenting this experience, hopefully some more colleagues will be motivated travelling to places where people need neurosurgical support.

1113

## Spine

Oral presentation

Free hand C1-C2 screw placement in CV junction anomaly: does anatomical complexity matter?

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### Objectives:

- To evaluate the accuracy of C1 C2 screws placement by free hand technique in craniovertebral junction anomalies
- To evaluate the intraoperative anatomical complexity and screws malposition association

**Background:** Conventionally, C1-C2 fixation is being performed under fluoroscopic guidance with considerable risks to adjacent vital structures like neuroaxis and/or vertebral artery. Unlike other areas of spine, CV junction region harbors many anatomical landmarks which are really helpful for free hand screw placement. Author want to highlights the merits of free hand screw placement based on anatomical landmarks in CV junction region.

**Methods:** We retrospectively reviewed and evaluated C1 Transpedicular, C1 lateral mass, C2 pars and C2 pedicle screws on post-operative CT scan of all patients who has undergone for posterior fusion from last 6 years with minimum 1 year follow up. We divided the whole patient in two groups simple and complex CVJ anomaly. The screws Malposition grades and direction were defined as per Hojo grading scale. The trajectory of malposition was further classified into medial, lateral, superior and inferior.

**Results:** Total 200 patients were included in the study. The mean age of presentation was 27.84 years. The major symptoms were spastic quadriparesis, restricted neck movements, sensory symptoms, LCN involvement, and autonomic involvement. On radiological evaluation 63(28.5%) patients were in simple CVJ anomaly group while 157 (71.5%) patients were in complex CVJ anomaly group. Overall malposition rate was 15.15%. The majority belongs to Grade-1(12.45%). The most common malposition trajectory was medial (34.75%) followed by inferiorly (28.5 %).

**Conclusions:** The rate of accurate screw placement by free hand technique without use of fluoroscopic or neuro-navigation guidance was comparable to the large studies published in literature. This practice can significantly cut down the fluoroscopy hazards to both the patient and health care personnel. The study highlights that anatomical complexity is no more contraindication for free hand technique.

1114

## Oncology

### ePoster presentation

#### Intraoperative MRI for the management of low and high grade gliomas: an institutional experience

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**Objectives:** To evaluate the safety and efficacy of utilizing iMRI for resection of low and high grade gliomas.

**Background:** Gliomas make up 25% of primary CNS tumors and comprise 80% of malignant CNS tumors. Extent of resection (EOR) of gliomas has proved a meaningful prognostic factor in median survival, time to progression, and post-operative complications. Intraoperative MRI (iMRI) has proven to be a widely popular instrument that maximizes EOR without significantly affecting surgical and functional outcomes. Here, we evaluate our institutional experience with iMRI resection of gliomas and assessing surgical outcomes.

**Methods:** All craniotomies for glioma resection performed at our tertiary care hospital from January 1, 2010-December 31, 2021 were included. Patients <18 years old were excluded. IRB approval was obtained from our institution prior to data collection.

**Results:** 49 patients underwent iMRI resection, 29 of which were male. Mean age was 29.41 years, ranging from 18 to 59. Tumor location was lobar in 53% of patients, insular 18%, multi-lobar 16%, and other (thalamic, pineal, optic, hypothalamic, ventricular) 14%. 39% of patients required more than 1 iMRI scan. GTR was achieved in 65% and near total resection in 8% of patients. A new onset neurological deficit or seizure was found in 39% of the patients in the immediate postoperative period, but only 18% at last follow up. The majority of postoperative events occurred after resection of multi-lobar or deep lesions. Only 12% of patients had an extended LOS (> 7 days). 14% of patients had a hospital readmission within 30 days after initial surgery, with an average LOS of 1.67 days. Recurrence was found in 26% of patients at last follow up. Mean follow up was 3.07 years post-operatively.

**Conclusions:** Utilization of iMRI allowed for maximization of EOR while minimizing long-term postoperative deficits, extended LOS and 30 day hospital readmissions in our patient population.

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## Paediatric

ePoster presentation

Management of hydrocephalus associated with myelomeningocele: can we efficiently reduce the rate of the shunt?

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**Objectives:** The aim of our study is to evaluate the efficiency of reducing shunt rate in hydrocephalus associated with myelomeningocele in our series.

**Background:** Myelomeningocele is the most serious and complex birth defect affecting the CNS compatible with life. Hydrocephalus associated with myelomeningocele is found in more than 80%. The rate of shunt in the old series reached 80%, but the complications of the shunt constitute an additional morbidity. Nowadays, many neurosurgeons seek to reduce the shunting rate in order to decrease morbidity.

**Methods:** We report a retrospective series of 100 cases of myelomeningocele and treatment of hydrocephalus was motivated by progressive macrocrania in 59 cases, inspiratory stridor in 4 cases, poor sucking in 3 cases, motor deficit in 1 case and a postoperative fistula in 5 cases.

**Results:** Shunt was performed postoperatively in all patients, except for the patient who presented with severe brainstem dysfunction, that requires ventricular drainage as a first step in emergency. In our series, 33 patients did not require treatment of hydrocephalus, on the other hand temporary ventricular drainage simultaneous with the repair of the myelomeningocele is carried out in 40 cases, while 27 cases required treatment of hydrocephalus in the postoperative period. Several protocols have been developed to reduce the rate of the shunt. In our series, treatment for hydrocephalus is still high at 67%, but selection bias impacted our results.

**Conclusions:** Indications for the treatment of hydrocephalus are well defined and are limited to evolutive intracranial hypertension signs and brainstem dysfunction. Ventricular dilatation and CSF leak are not valuable indications for ventricular drainage. Monitoring criteria allowed us to tolerate a certain increase in the size of the ventricles. This attitude will lead to a reduction in the rate of the shunt in children with myelomeningocele and thus reduce the morbidity linked to the shunt.

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## Trauma

ePoster presentation

### Awake thoracic spinal hemilaminectomy: report of two uncommon cases of spinal cord injury following stabbing assault

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**Objectives:** To describe the feasibility of awake surgery in patients with stab wounds causing spinal cord injury and functional outcomes.

**Background:** We present two cases of patients treated at a tertiary hospital in São Paulo, Brazil, who underwent Awake hemilaminectomy for removal of the foreign body under direct visualization.

**Methods:** Spinal cord injuries commonly result from automobile accidents and falls, with penetrating injuries, particularly gunshot wounds, representing the third leading cause. Spinal cord injuries caused by stab wounds are relatively uncommon, accounting for approximately 0.3-2.1% of all spinal cord injury cases. The thoracic region is most frequently affected (up to 63% of cases), followed by the cervical region (up to 30% of cases) and the lumbar region (6.7% of cases).

**Results:** Both patients underwent Awake hemilaminectomy with local anesthesia and mild sedation. The stab wound was directly visualized and the foreign body was removed following hemilaminectomy. After foreign body removal, anesthetic depth was increased, meticulous hemostasis was achieved, and thorough irrigation of the cavity with saline solution was performed. The wound was closed in layers without evidence of vascular or neural tissue injury. Both patients were discharged 48 hours after the procedure. Follow-up evaluations revealed significant improvement in previously observed sensory and motor deficits.

**Conclusions:** Awake spinal surgery allows for real-time neural feedback during the procedure and reduces the side effects associated with general anesthesia. The evaluation of these patients demonstrated the potential to reduce surgical costs, postoperative hospital stays, and complications, thereby improving overall quality of life. However, further analytical studies are needed to define the long-term efficacy of this approach.

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## Global Neurosurgery

ePoster presentation

### Challenges and aspirations of neurosurgical residents in Germany: insights from a questionnaire-based survey

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**Objectives:** This study aimed to investigate the challenges and aspirations of neurosurgical residents in Germany through a questionnaire-based survey. The objectives were to assess satisfaction with the training program, identify sources of dissatisfaction, explore work hours and their impact, examine residents' psychological well-being, and determine their future subspecialty preferences.

**Background:** Neurosurgical residents in Germany face numerous challenges, including work hour limitations, the need for a balanced work-life equilibrium, comprehensive training, mentorship, a positive working environment, and career prospects. The psychological and career implications of these challenges are concerning. This manuscript aims to comprehensively analyze these challenges from the perspectives of neurosurgical residents.

**Methods:** A questionnaire-based survey was conducted anonymously among 120 neurosurgical residents from various training hospitals nationwide. The survey utilized a quantitative questionnaire as the data collection tool. The study was conducted from April 2021 to September 2022.

**Results:** Out of the 120 participants, 66 (55%) were male and 54 (45%) were female. Around 36.6% of respondents expressed moderate satisfaction (rated 3 out of 5) with the training program, with limited surgical opportunities cited as a primary dissatisfaction factor by 40% of respondents. The majority (62%) reported working between 60-80 hours per week. Frequent frustration was reported by 48% of residents, while 52% experienced occasional episodes of depression. Over 50% of residents expressed a desire to specialize in oncology.

**Conclusions:** The survey findings provide valuable insights into the challenges and aspirations of neurosurgical residents in Germany. These results serve as a basis for improving the training system, enhancing the work environment, and guiding future planning in the field. Addressing issues such as limited surgical opportunities, high levels of dissatisfaction, and psychological well-being concerns are essential for optimizing resident training. The expressed interest in subspecializing in oncology offers guidance for shaping the training program's future direction.

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## Neurovascular Surgery

ePoster presentation

### Bilateral bypass common carotid artery – middle cerebral artery: a rare case report

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**Objectives:** To describe the experience of Santa Casa de São Paulo in performing bilateral high-flow bypass, feasibility of bilateral bypass and functional outcomes.

**Background:** Vascular bypass in neurosurgery is performed to prevent ischemic complications in cerebrovascular diseases. Described for the first time by Yasargil, in 1969. Bilateral performance is infrequent, mainly in the high-flow extra-intracranial form, with only two reports in the literature in a recent search, but none of them describing anastomosis of the common carotid artery - middle cerebral artery bilaterally. The present study reports a patient who passed through bilateral bypass of the common carotid artery to the middle cerebral artery, apparently being the first report in the literature of this based on our literature review.

**Methods:** Case report of a rare case high-flow bilateral bypass.

**Results:** Female, 55 years old, with arterial hypertension and history of smoking. She had atypical headache, considered a sentinel event, and was investigated with cerebral angiography which diagnosed complex aneurysms located in the ophthalmic segment of the left internal carotid artery and in the ophthalmic segment of the right internal carotid artery. High-flow bilateral extra-intracranial bypass was chosen, excluding the aneurysm (trapping). The postoperative angiotomography exam revealed patency of both bypass and exclusion of aneurysms.

**Conclusions:** In complex aneurysms, direct clipping may not be possible due to morphology and anatomical location. In these cases, a bypass is usually indicated with high or very high flow. We present this case due to its particularity, demonstrating that, in some cases, bilateral high-flow bypass can be indicated.



## Neurovascular Surgery

ePoster presentation

Cerebral revascularization (bypass): indications, surgical techniques, and experience in a tertiary hospital in Brazil

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**Objectives:** This study aims to demonstrate the indications, surgical techniques, and institutional experience in cerebral revascularization procedures.

**Background:** Cerebral revascularization requires microsurgical techniques that demand years of training for a neurosurgeon to become proficient. After careful individual patient analysis for cerebral revascularization indications, we present a case series operated by the same neurosurgeon in a tertiary hospital in São Paulo.

**Methods:** This is a retrospective review of electronic and physical medical records of cases requiring cerebral revascularization surgery (bypass) between 2007 and 2022 in a tertiary hospital in Brazil.

**Results:** A total of 22 patients were evaluated, with 2 patients undergoing 2 revascularization procedures for bilateral complex aneurysms and Moyamoya disease. Patients operated on for aneurysms (n=17, 18 procedures) involved supraclinoid internal carotid artery (n=6), cavernous internal carotid artery (n=6), middle cerebral artery (n=5), and posterior-inferior cerebellar artery (PICA) (n=1). Patients operated on for Moyamoya disease (n=5) underwent a total of 6 procedures. Anastomoses were performed between superficial temporal artery (STA) and middle cerebral artery (MCA) (n=5), encephalo-arteriosynangiosis (EDAS) (n=1), external carotid artery and MCA (n=7), common carotid artery and MCA (n=7), occipital artery and PICA (n=1), and internal carotid artery and MCA (n=3). The patency rate of the anastomoses was 94.7% (18/19) among the evaluated cases. Patients were followed up using the Glasgow Outcome Scale (GOS), with the following **Results:** 17 patients had a GOS score of 4/5 (70%), 4 patients had a GOS score of 3 (23.5%), and only one non-surgical death occurred.

**Conclusions:** The development of microsurgical skills enables patients with challenging conditions such as complex aneurysms and cerebral ischemic diseases to be treated in a more systematic manner with excellent outcomes.

## Peripheral

Oral presentation

### Anatomical aspects of the selective infraspinatus muscle neurotization by spinal accessory nerve

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**Objectives:** To describe the anatomy of the thoracic portion of the spinal accessory nerve (SAN) and determine the feasibility of the dorsal SAN to the infraspinatus branch of the suprascapular nerve (IB-SSN) transfer in the adult population.

**Background:** The suprascapular nerve (SSN) is commonly reconstructed by SAN transfer. However, reinnervation of its branch to the infraspinatus muscle (IB-SSN) is poor. Reconstruction of the SSN in cases of scapular fractures is frequently neglected in clinical practice.

**Methods:** The morphological study was performed on 25 adult human cadavers. The course and the length of SSN of minimal diameter of 2 mm within the trapezius muscle, the length of the distal stump of IB-SSN to its branching point and the length of the SSN available for reconstructive procedure were measured. The feasibility study of the SAN-IB-SSN neurotization performed by using a bony canal under the spine of scapula was performed.

**Results:** The mean distance of the SAN from the spine was 8.5cm ( $\pm 0.88$ ) at the point where it perforates the trapezius muscle and 4.49cm ( $\pm 0.72$ ) at the most distal part of the nerve. The mean length of the intramuscular portion of the nerve was 14.74cm ( $\pm 1.99$ ). It ran under a mean latero-medial angle of 15.54 degrees ( $\pm 2.51$ ). The mean distance between the medial end of the scapular spine and the SAN was 2.44cm ( $\pm 0.64$ ). The mean length of the IB-SSN was 3.6cm ( $\pm 0.67$ ). The mean length of the SAN stump which was mobilized from its original course and transferred to the infraspinous fossa to reach distal stump of the IB-SSN was 8.09cm ( $\pm 1.6$ ).

**Conclusions:** Direct SAN to IB-SSN transfer is anatomically feasible in the adult population. This procedure might find its place mainly in cases of infraspinatus palsy associated with scapular fractures and in some cases of brachial plexus palsy.

## Trauma

ePoster presentation

### Two-stage anatomic temporalis muscle dissection for cranioplasty: surgical technique and single-surgeon experience

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**Objectives:** To describe a methodical, two-stage dissection technique for cranioplasty.

**Background:** Temporalis muscle management remains one of the most challenging aspects of cranioplasty and dissection-related complications are still common. Since 2019, the senior author has developed and used a methodical, two-stage anatomic dissection technique to separate the scalp and temporalis muscle from the underlying brain. This technique is thought to facilitate dissection and minimize brain injury, while optimizing cosmetic outcomes.

**Methods:** All patients who underwent cranioplasty between January 2019 and February 2023 were identified from a prospectively maintained database. Charts were retrospectively reviewed. Demographic, clinical, and procedural data were extracted and analyzed.

**Results:** Twenty-nine patients, 20 men and 9 women with median age 37 years (range 17-72), were identified. Indications for craniectomy were: trauma in 18 (62.1%), hemorrhagic stroke in 5 (17.2%), ischemic stroke in 4 (14.8%), aneurysmal subarachnoid hemorrhage in 2 (6.9%). Median pre-cranioplasty mRS and GCS scores were 5 (range 0-5) and 14 (range 3-15), respectively. Median time to cranioplasty was 131 days (range 32-1,717). Cranioplasty was technically successful in all patients, with a median operative time of 106 minutes (range 62-182). There were no intraoperative complications. Postoperative complications occurred in 3 patients (10.3%): hemorrhagic brain contusion (n=1), meningitis (n=1), seizure (n=1). Of those, one patient (3.4%) died two weeks after surgery from suspected pulmonary embolism. After a median follow-up of 4 months (range 1-44), all survivors have either remained clinically stable or exhibited neurologic improvement. Cosmetic results were good or excellent in 28 (96.6%) and acceptable in 1 (3.4%).

**Conclusions:** Two-stage anatomic dissection of the scalp and temporalis muscle can maximize surgical efficiency while leading to excellent outcomes. Cranioplasty should be considered a low-complexity neurosurgical procedure. Safe and efficient management of the temporalis muscle should be emphasized during residency training.

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## Functional

ePoster presentation

### Dorsal Root Ganglion (DRG) stimulation for secondary neuropathic thoracic pain: report of two successful cases in the public health system

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**Objectives:** To describe the experience of Santa Casa de São Paulo, the first public institution in Brazil to implement DRG and feasible of DRG for thoracic pain.

**Background:** Neuromodulation techniques such as DRG (dorsal root ganglion) are emerging as treatment options for refractory neuropathic pain. DRG allows for frequent and finer adjustments to improve pain and subsequently enhance the patient's quality of life. DRG can stimulating more focused areas without the dependence on paresthesias, unlike other types of stimulation.

**Methods:** Report of two cases with refractory neuropathic pain in the thoracic region, secondary to tumors.

**Results:** Two cases of refractory neuropathic pain in the thoracic region, secondary to tumors, are reported. In the first case, a 46-year-old female patient with thymoma and metastasis underwent thoracotomy and tumor resection. Subsequently, she developed neuropathic pain in the right thoracoabdominal transition and T6-T8 region. Despite receiving various treatments, including gabapentin, tricyclic antidepressants, and opioids, her pain remained uncontrolled. Following DRG electrode implantation in the T7 and T8 roots on the right side, the patient experienced complete pain relief and significant improvement in quality of life. The second case involved a 68-year-old male patient with lung cancer, rib arch invasion, and hepatic metastasis. Despite receiving chemotherapy, radiation therapy, and anti-algic radiation therapy, the patient developed neuropathic pain in the right rib cage. Radiofrequency rhizotomy was performed but failed to alleviate the pain. After DRG electrode implantation in the T3 and T4 roots on the right side, the patient experienced significant pain reduction and discontinued the use of opioids.

**Conclusions:** The successful outcomes observed in these cases support the growing evidence of the important role of DRG stimulation in treating refractory neuropathic pain. Implementing DRG stimulation in public healthcare institutions can provide a valuable treatment option for patients who have exhausted conventional therapies.

## Neurovascular Surgery

ePoster presentation

Retrovermian pial arteriovenous fistula with cerebellar venous congestion mimicking infarction or tumor

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**Objectives:** To report a unique case of retrovermian pial arteriovenous fistula (pAVF) with cerebellar venous congestion and edema mimicking the appearance of an ischemic stroke or a tumor on imaging.

**Background:** Cerebellar pAVFs are exceedingly rare and, aside from hemorrhage, may present with cerebellar venous congestion and edema.

**Methods:** Case report and literature review.

**Results:** A 67-year old man with a prior history of ischemic stroke and multiple cardiovascular risk factors, presented with new-onset headaches. CT and MRI revealed a left cerebellar mass lesion compressing the fourth ventricle, raising concern for a superior cerebellar artery territory infarct or intra-axial cerebellar tumor. However, CTA showed abnormally increased vascularity throughout the left cerebellar hemisphere. Thus, DSA was obtained, demonstrating a retrocerebellar pAVF versus dural arteriovenous fistula of the falx cerebelli, fed by a well-developed posterior meningeal artery arising from the right vertebral artery, with extensive retrograde leptomeningeal venous drainage into the left cerebellar hemisphere. The patient underwent microsurgical exploration via a midline suboccipital craniotomy, revealing a retrocerebellar pAVF, which was microsurgically disconnected. The patient had an uneventful postoperative course and his headaches resolved. Postoperative DSA confirmed complete obliteration of the fistula. Repeat brain MRI 3 months later showed resolution of cerebellar edema and mass effect in the posterior fossa.

**Conclusions:** Though exceedingly rare, arteriovenous shunt lesions in the posterior fossa can cause substantial cerebellar venous congestion and edema, mimicking an ischemic stroke or a tumor. Cerebrovascular pathology should always be considered in the differential diagnosis of atypical cerebellar mass lesions.

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## Spine

ePoster presentation

Spinal Cord Injury (SCI) in unconscious Ankylosing Spondylitis (AS) patient: the importance of imaging in diagnosis and decision-making

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**Objectives:** Identify unconscious patients with unknown AS when spine trauma is present and have the knowledge that SCI is prevalent when vertebrae fractures are present.

**Background:** SCI in unconscious patients with AS have higher mortality and complications rates when vertebral fractures are present compared to the general population. Diagnostic delays are frequently observed in AS patients since most of them only exhibit symptoms of neurologic deterioration after minor trauma. Lack of awareness of these factors hinders prompt AS diagnosis in unconscious patients, highlighting the importance of imaging diagnosis in guiding medical decisions.

**Methods:** This study includes a literature review of medical management in unconscious AS patients observed in an emergency room, along with a case report for illustrative purposes.

**Results:** A 70-year-old man was admitted in an unconscious state into a emergency room after a minor trauma standing height fall, followed by sudden flaccid tetraplegia, sensory anesthesia at the C4 level, spinal shock and reversed asystole rhythm. A cervical spine CT scan revealed a AOSpine type C C5-C6 vertebrae fracture dislocation resulting in spinal cord compression. Other findings were consistent with the characteristic "bamboo" degenerative discopathy associated with AS. Due to the patient's frail clinical condition, surgical cervical spine treatment was unfeasible, and the patient deceased 5 days after admission. Diagnostic criteria in AS patients includes computerized tomography (CT) bone axial imaging screening for sacroiliitis, costovertebral joint ankylosis, osteoporosis, and vertebral ossifications involving facets, intervertebral discs, and spinal ligaments. A positive HLA-B27 antigen test is unnecessary, since only 5% of positive cases develop AS.

**Conclusions:** CT axial diagnostic imaging identifies unconscious patients with unknown AS that harbor spinal fractures and SCI in an emergency room scenario. This knowledge aids in the treatment decision making process.

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## Spine

Oral presentation

Closed manual reduction of traumatic facet dislocations of the cervical spine: operative video and technical nuances

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**Objectives:** To report a safe and efficient technique of closed manual reduction for traumatic facet dislocations of the cervical spine.

**Background:** Closed reduction of cervical facet dislocations is typically achieved in gradual fashion using Gardner-Wells tongs and weights. Manual reduction is seldom used.

**Methods:** Operative video.

**Results:** We present a series of 3 patients with traumatic facet dislocations of the cervical spine (bilateral: 2, unilateral: 1) who underwent successful closed manual reduction followed by surgical stabilization and fusion. Technical nuances and principles of closed manual reduction are described in a step-by-step fashion.

**Conclusions:** In well-selected cases, closed manual reduction under live fluoroscopy and continuous neurophysiologic monitoring allows immediate restoration of spinal alignment, facilitating subsequent surgical stabilization and fusion. In contrast to Gardner-Wells tongs and weights, patients are not tethered to their beds and can undergo MRI.

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## Global Neurosurgery

ePoster presentation

### Spontaneous bleeding from orbital cavernous hemangioma: a case report

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**Objectives:** Presenting a case of **Spontaneous Bleeding From Orbital Cavernous Hemangioma**, can serve as an educational tool for medical students, residents, and other healthcare professionals. It can enhance their understanding of the pathophysiology, clinical features, diagnosis, and management of orbital cavernous hemangiomas with spontaneous bleeding.

**Background:** Cavernous hemangioma is the most frequent primary orbital tumor seen in adults. It is a benign lesion but may compromise optic nerve function. Acute presentation with hemorrhage into the tumor is a rare occurrence with only ten cases reported in literature.

**Methods:** We report an unusual case of a sudden painful proptosis with unilateral blindness due to acute bleeding of cavernous hemangioma, MRI revealed an intracanal soft tissue mass of the left orbit.

**Results:** Patient underwent a transcranial approach and tumor was removed. The histopathological examination revealed a cavernous hemangioma. The patient had complete symptomatic recovery following surgery.

**Conclusions:** Spontaneous bleeding in an orbital cavernous hemangioma is extremely rare, However once bleeding, severe opthalmopathy may suddenly develop, necessitating emergency surgery, as observed in the present case, and precise diagnosis of Orbital hemangioma by careful observation using MRI is essential. Generally, the surgery by transcranial approach is still proper for almost all orbital cavernous hemangiomas with good surgical outcomes.



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## Neurovascular Surgery

ePoster presentation

Contralateral prechiasmatic interoptic approach for microsurgical clip ligation of a medially pointing paraclinoid internal carotid artery aneurysm

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**Objectives:** To provide a step-by-step video illustration of the surgical technique for microsurgical clip ligation of a medially pointing paraclinoid internal carotid artery (ICA) aneurysm, via a contralateral prechiasmatic interoptic approach.

**Background:** Paraclinoid aneurysms originate from the ICA between the distal dural ring and posterior communicating artery and are relatively rare. Those aneurysms are nowadays often treated endovascularly, though, in well-selected cases, microsurgical treatment may provide a more durable result, while preserving vital arterial branches and perforators.

**Methods:** Microsurgical video.

**Results:** A previously healthy 29-year old woman was incidentally found to have a left paraclinoid ICA aneurysm. Cerebral angiography confirmed the presence of a 3-mm medially pointing aneurysm arising from the medial aspect of the paraclinoid left internal carotid artery, across from the origin of the left ophthalmic artery, consistent with a carotid cave or superior hypophyseal artery aneurysm. Given the patient's young age and long life expectancy, aneurysm treatment was offered. Though both microsurgical and endovascular approaches were considered, microsurgical clip ligation was ultimately preferred, given its superior durability and ability to preserve small ICA perforators, particularly superior hypophyseal arteries. For that purpose, a contralateral interoptic approach was selected, which offers a direct path to the medial surface of the contralateral paraclinoid ICA, minimizes manipulation of the optic nerve, and avoids the need for anterior clinoidectomy. Following an uneventful procedure and postoperative course, the patient was discharged home a few days later, with normal neurologic exam and vision. Postoperative angiography confirmed complete obliteration of the aneurysm.

**Conclusions:** Even in the current endovascular era, microsurgery remains an excellent treatment option for well-selected paraclinoid ICA aneurysms, especially in young healthy patients. For medially pointing aneurysms, the contralateral interoptic trajectory offers a straightforward approach, while avoiding excessive optic nerve manipulation, obviating the need for an anterior clinoidectomy, and allowing the preservation of superior hypophyseal arteries.

## Global Neurosurgery

ePoster presentation

Pilot survey of interdisciplinary discharge planning steps for traumatic brain injury and spinal cord injury in Ugandan hospitals

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**Objectives:** 1) Investigate overall completion rate of discharge planning steps across medical providers, rehabilitation providers, patients, caregivers, and medical charts;

2) Compare discharge planning step completion between patient and caregiver responses.

**Background:** Traumatic Brain Injury (TBI) and Spinal Cord Injury (SCI) are leading causes of hospitalization in Uganda. Rehabilitation across the care continuum optimizes functional recovery. International guidelines provide limited information for interdisciplinary discharge planning from Ugandan acute wards.

**Methods:** A pilot descriptive survey assessed discharge for TBI/SCI patients from Ugandan acute wards. Consultation of Ugandan and international neurological experts informed a list of 12-14 discharge planning steps in local practice. Purposive convenience sampling was conducted on medical providers, rehabilitation providers, patients, caregivers, and medical charts from two Ugandan hospitals. Providers repeated surveys across multiple discharges ("provider discharges"). Patients with 15/15 Glasgow Coma Scale (GCS) were recruited. For patients with <15/15 GCS, caregivers were recruited. Descriptive statistics analyzed completion and documentation rate of the discharge planning steps.

**Results:** 44 medical provider discharges, 21 rehabilitation provider discharges, 10 patients, and 10 caregivers completed survey responses, and 70 medical charts were reviewed. All steps were reported completed by 0% medical provider discharges, 24% rehabilitation provider discharges, 0% patients, and 0% caregivers. 0% of medical files documented all steps. Consultation with a physiotherapist as a discharge planning step was reported by 0% of patients and 20% of caregivers. Physiotherapy recommendation after discharge was reported by 30% of patients and 60% of caregivers, but 0% of these patients and 50% of these caregivers reported receiving physiotherapy follow-up instructions.

**Conclusions:** Discharge planning may be inconsistent across healthcare providers and documentation. Patients and caregivers may not receive information for continued rehabilitation. Consistent discharge planning may improve care coordination. Further investigation is needed to confirm discharge planning steps for interdisciplinary practice in Uganda.

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## Trauma

Oral presentation

Limitations of the ASIA Impairment Scale for prognostication of spinal cord injuries in acute care

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**Objectives:** To evaluate the American Spinal Injury Association (ASIA) international Standards for Neurologic Classification of Spinal Cord Injury (ISNCSCI) impairment scale in predicting outcomes for spinal cord injuries (SCI) in the acute trauma care setting.

**Background:** The determination of the motor, sensory and autonomic function of patients with spinal cord injury is essential for clinical and research purposes and the American Spinal Injury Association (ASIA) International Standards for Neurologic Classification of Spinal Cord Injury (ISNCSCI) impairment scale is a standard scale used. We sought to evaluate this scale with respect to its application in the acute trauma care setting with respect to prognosticating outcomes in spinal cord injuries.

**Methods:** A comprehensive search of medical literature was conducted using PubMed, Google Scholar, and relevant study bibliographies to identify articles evaluating the application of the ASIA impairment scale. Inclusion criteria involved studies and review articles assessing the ASIA impairment scale for prognostication of functional outcomes in SCI. Articles not discussing SCI or the ASIA impairment scale were excluded.

**Results:** The review of available literature highlights the barriers to consistent application of the ASIA impairment scale. The inconsistent use of the ASIA scale is influenced by various factors, including suboptimal training, inadequate dissemination of scale revision, inconsistent application among trauma centers, and the inherent limitations and confounders of the scale. Several suggested alterations and alternative scales for use in acute care settings were also reported.

**Conclusions:** We have found that there are limitations of applying the ASIA impairment scale with an inconsistent application of the ASIA scale across different institutions, particularly in the acute care setting. There is a need to improve the evaluation of patients with spinal cord injury for research and clinical purposes in the acute trauma care setting.

## Epilepsy

Oral presentation

Age at onset of epilepsy rather than subtype determines pre- and postoperative profiles of patients with focal cortical dysplasia

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**Objectives:** Focal cortical dysplasia (FCD) is a brain disorder associated with epilepsy and cognitive impairment.

**Background:** Epilepsy surgery is often considered for individuals with intractable seizures. Besides to favorable seizure outcome, postoperative cognitive functioning constitutes an important outcome measure in FCD surgery. In the present study, we explored the impact of FCD type and age at onset of epilepsy (AOE) on cognitive profiles following surgical therapy of FCD.

**Methods:** This retrospective study was conducted on 98 patients with histopathologically confirmed FCDs who had undergone surgical treatment for epilepsy between 1989 and 2017 at the University Hospital Bonn. Comprehensive neuropsychological assessment for intelligence quotient (IQ) and six cognitive domains were performed before and approximately 12 months after surgery. Statistical analyses, including ANCOVA and ANOVA, were conducted to assess cognitive profiles and changes after surgery.

**Results:** Patients with early AOE (<6 years, n=53) had lower preoperative cognitive scores in IQ and motor functions compared to those with late AOE (≥6 years, n=45). Differences in mean cognitive scores for each domain were not observed between FCD types IIa and IIb. Surgery resulted in a significant decrease in seizure frequency and the number of antiepileptic drugs. Attention scores and motor functions significantly increased after surgery in patients with early AOE. Linear stepwise regression model identified the preoperative mean values for attention and motor function as the strongest determinants for postoperative change with an inverse correlation (attention: p=0.001; motor functions: p<0.0001).

**Conclusions:** These findings indicate that the AOE emerged as a more influential factor in distinguishing between pre- and postoperative cognitive differences than the FCD type. Furthermore, the preoperative scores were the strongest predictors of postoperative changes for all cognitive domains and should therefore be considered when evaluating a surgical therapy for epilepsy in patients with FCD.

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## Global Neurosurgery

ePoster presentation

Management of orbital tumors with 08 cases at the neurosurgery department of Military Hospital in Rabat-Morocco

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**Objectives:** This study aims to review the place of neurosurgery in the management of orbital tumors as well as the important role that the neurosurgeon should play in the evaluation and treatment of this pathology.

**Background:** Orbital tumors are lesions that appear in the orbital craniofacial limits. To this end, teams of different ophthalmologist and neurosurgeon specialists provide the treatment of these tumors. We present here the experience of the neurosurgery department of the military hospital of Rabat in the management of these tumors.

**Methods:** We retrospectively evaluated the records of 08 patients with orbital tumors, hospitalized in our neurosurgery department from January 2020 to December 2021.

**Results:** In 06 patients, five different histological entities were observed, a transcranial approach was used for five patients, and only three underwent lateral orbitotomy, Postoperative results varied, depending on pathology, location and the extent of the tumors, as well as the approach.

**Conclusions:** The aim of our study was to present the experience of our service and to show the place of neurosurgery in the management of orbital tumors even if this management sometimes requires very close multidisciplinary collaboration.

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## Oncology

ePoster presentation

### Bilateral Thalamic Glioma in pediatric patients: a systematic review and case report

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**Objectives:** To conduct a systematic review of pediatric thalamic gliomas and describe a clinical case of bilateral thalamic glioma. The importance lies in the limited number of reported cases.

**Background:** Bilateral Thalamic Gliomas are extremely rare pathologies, representing 1 to 1.5% of all intracranial neoplasms, with an even lower incidence in the pediatric population. We present the case of a 15-year-old male patient who presented with moderate-intensity, progressive, and rapidly evolving holocranial headache. Magnetic resonance imaging revealed the presence of bilateral thalamic glioma, which was subjected to stereotactic biopsy. The histopathological report confirmed a high-grade glioma.

**Methods:** A literature review was conducted from January 1964 to August 2022, extracting relevant information regarding the clinical presentation, diagnosis, treatment plan, prognosis, and survival in the pediatric population. This information was then correlated with the diagnosed case in our institution.

**Results:** The symptomatology of bilateral thalamic gliomas varies between pediatric and adult populations. Presumptive diagnosis is made through contrast-enhanced magnetic resonance imaging, complemented by spectroscopy. Definitive diagnosis is achieved through stereotactic biopsy with histopathological and immunohistochemical studies. Oncological therapy and prognosis are directly related to the type of glioma.

**Conclusions:** Bilateral Thalamic Glioma is a rare pathology, and due to the limited number of reported cases in the pediatric population, publishing cases on this topic contributes to the scientific community's better understanding of the disease's manifestations. This, in turn, facilitates early diagnosis and more effective treatments, despite the often unfavorable prognosis.

## Hydrocephalus

ePoster presentation

### Alternative treatment for hydrocephalus in a rare case of myelocystocele: Flexible Neuroendoscopy (FN) approach

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**Objectives:** Describe a rare Myelocystocele presented clinically as Myelomeningocele and discuss the hydrocephalus treatment of a Myelocystocele after its initial treatment, using the flexible neuroendoscope.

**Background:** Terminal Myelocystocele is a uncommon congenital spinal dysraphism (1-5%), in which early surgical intervention is crucial for optimizing the child's neurological function. A rare complication in a post surgical correction is Recurrent Hydrocephalus and its manage still challenging since other cerebral malformations usually concomitant are underdiagnosed by traditional methods and corroborate for its development.

**Methods:** This study includes a literature review of a surgical management and its complications in Myelocystocele patients with a case report for exemplification.

**Results:** A Waardenburg Syndrome type I female infant born at term, with a 10 centimeters lumbosacral dysraphism, hip dislocation and left kidney agenesis on the 4th day of birth, has her dysraphism surgically explored, identifying an abnormal skin in which was dissected and 120ml of cerebral spinal fluid (CSF) in a cyst was drained. A dural defect was observed with a lipomatous and nerve root content, not visualizing the placode. The dural sac was reconstituted, being identified as Myelocystocele. One week after, a MRI scan identified a non obstructive hydrocephalus and a Flexible Neuroendoscopy was performed and visualized a narrow Monroe foramen, absence of the mammillary bodies, the basilar artery and the choroid plexus. Due to the malformations, opted for a ventriculo-peritoneal shunt under direct observation by FN. Postoperatively, there were no additional neurological deficits and hydrocephalus was solved.

**Conclusions:** The Terminal Myelocystocele with hydrocephalus is a rare condition with few studies in literature describing its management. Furthermore, flexible neuroendoscopy has a high diagnostic capacity for cerebral and ventricular malformations that are involved with CSF dynamic and therapeutic option for hydrocephalus since its allow a safer and more accurate shunt placement, although other neurosurgeries modalities are necessary to correct the malformation.

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## Endovascular Neurosurgery

ePoster presentation

Vein of Galen arteriovenous malformation in an infant: a case report

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**Objectives:** To report a rare case of malformation of the vein of Galen.

**Background:** Infant, male, 6 months old, with a history of seizures since the first weeks of life and clinical signs of intracranial hypertension. Imaging exams revealed a mural type malformation of the Vein of Galen (VMG) associated with obstructive hydrocephalus. The patient underwent endovascular treatment in three sessions, with embolization and complete occlusion of the Vein of Galen shunt, along with ventriculoperitoneal shunt placement, showing good neurological evolution.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2023 and a literature review.

**Results:** VMG is a rare condition and accounts for approximately 1% of all intracranial vascular malformations. This pathology occurs before the tenth week of gestation and consists of multiple AV fistulas from the deep choroidal arteries draining into the Median Prosencephalic Vein (of Markowski), which is an embryonic precursor of the Vein of Galen. It can present with signs of heart failure, hydrocephalus (due to venous congestion), or oligohydramnios, a consequence of low renal flow (secondary to heart failure). Our patient presented later symptoms predominantly associated with hydrocephalus. While the diagnosis is often made in the neonatal period, changes can be observed on ultrasound as early as the 14th week of gestation, and confirmation can be obtained postnatally through transfontanelle Doppler. Angiographic study is considered the gold standard, and embolization is the current safest and most effective treatment. Total embolization is not always necessary, as partial occlusion can lead to clinical improvement.

**Conclusions:** The significance of early recognition of this rare anomaly lies in preventing severe repercussions and unfavorable prognosis, allowing for better postnatal management.



## Hydrocephalus

Oral presentation

Reliability and effectiveness of the dry-field maneuver used for bleeding control in neuroendovascular procedures in long-term follow-up

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**Objectives:** We aimed to report the effects and clinical results of the dry-field maneuver for bleeding control during neuroendoscopic procedures with massive bleeding.

**Background:** As the frequency of neuroendoscopic procedures increases, the management of their complications gains importance. Massive bleeding is a significant complication of this procedure and can lead to morbidity and mortality. Although techniques such as cauterization and ringer lactate irrigation are used in case of massive bleeding, dry-field maneuver which is provided with evacuation of the all csf is effective as the last option in cases where these are not sufficient.

**Methods:** A retrospective study was performed in patients who underwent endoscopic surgery in which dry-field maneuver was used for bleeding control between 2012 and 2022.

**Results:** Dry-field maneuver was used in intraventricular endoscopic operations for bleeding control in 13 patients. Nine of the patients were male and four were female. The mean age of this group was 17 (min 0.5, max 51), and the mean age in pediatric cases was 8 years. Bleeding occurred during surgical resection of cranial masses such as craniopharyngioma, arachnoid cyst, colloid cyst, astrocytoma and glioma in eight patients, during endoscopic third ventriculostomy due to aqueductal stenosis in two patients and intraventricular hematoma evacuation in one patient. Bleeding was totally controlled in all patients with the dry-field maneuver. Postoperative radiological imaging was performed, varying degrees of pneumocephalus and intraventricular hematoma were seen. The mean follow-up was 7.5 years, and the patients had no acute or chronic vascular or neurological complications. 2 morbidity occurred, but these were due to uncontrollable tumor. There was no morbidity related to the surgery.

**Conclusions:** Dry-field maneuver, which provides hemostasis and better vision, is a technique that can be used to control massive hemorrhage in neuroendoscopic procedures. Due to these features, it may be possible to use dry-field maneuver in elective surgeries.

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## Spine

ePoster presentation

### Medullary lesions in Erdheim Chester disease: a case report

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**Objectives:** Our work highlights another different clinical, radiological and pathological manifestation associated with ERDHEIM CHESTER disease that should be considered.

**Background:** ERDHEIM CHESTER disease (ECD) called also non-Langerhans Histiocytosis, is a rare illness, which can present various unusual clinical aspects. It is a Histiocytosis characterized by an infiltration of various tissues and organs, bones, retroperitoneum, pleuro-pulmonary sites, skin, and central nervous system. The most frequent central nervous system manifestations of ECD are diabetes insipidus, cerebellar syndromes, orbital lesions, and extra-axial masses involving the dura.

**Methods:** we report a rare case with spinal cord compression on the context of ERDHEIM CHESTER disease.

**Results:** The patient received laminectomy from T4 to T6 and from T12 to L2 with stabilization at the two sites. The epidural lesion was well visualized, pale, firm, and rubbery, readily dissected from the dura and removed partially. The histological findings were compatible with ERDHEIM CHESTER histology.

**Conclusions:** In summary, Erdheim Chester disease being multisystem disease, multidisciplinary approach would help in better patient care and management. Moreover, the medullary lesions should be considered in ECD manifestation even if is infrequent.

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## Global Neurosurgery

ePoster presentation

### Pott Puffy tumor: a rare complication of sinusitis - a case report

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**Objectives:** To report a rare case of *Pott Puffy Tumor*.

**Background:** A 15-year-old male patient with a recent upper respiratory tract infection and progressively intense headache. He developed left orbital swelling over a span of 15 days. Physical examination revealed afebrile status, edema, erythema, and bilateral periorbital cellulitis, with left frontal swelling and fluctuation. Computed tomography (CT) of the face and skull indicated pansinusitis with subcutaneous frontal abscess, bilateral frontal empyema, and left orbital abscess. No meningeal signs or focal neurological deficits were observed. The patient underwent craniotomy for bilateral frontal empyema drainage, followed by drainage of the orbital abscess through a left supraorbital approach. Intravenous broad-spectrum antibiotic therapy with vancomycin, ceftriaxone, and metronidazole was initiated.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2023 and a literature review.

**Results:** Acute frontal sinusitis can progress to intra or extracranial complications, most commonly through venous dissemination with thrombophlebitis of the diploic veins and septic emboli, or via direct extension. Common signs and symptoms include headache, purulent rhinorrhea, fever, frontal fluctuating swelling, and periorbital cellulitis. The gold standard diagnostic tool is CT, which confirms osteomyelitis in the outer wall of the frontal sinus, indicates Pott Puffy Tumor (PPT), and reveals the presence of intracranial or intraorbital complications. The most frequent pathogens involved are *Staphylococcus aureus*, *Streptococcus* species, and anaerobes, often with the presence of multiple organisms. Management of PPT focuses on early diagnosis, complementary exams, and broad-spectrum antibiotic therapy.

**Conclusions:** PPT is a rare complication of acute frontal sinusitis, characterized by subperiosteal abscess, frontal bone osteomyelitis, and orbital abscess. Early diagnosis helps prevent severe complications, such as meningitis, encephalitis, and septic thrombosis of venous sinuses, especially the superior sagittal sinus, thereby reducing morbidity and mortality.

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## Global Neurosurgery

Oral presentation

Global pediatric epilepsy surgery: developing a multidisciplinary program in Uganda

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**Objectives:** We aimed to establish a global neurosurgery pilot to develop a pediatric epilepsy surgery program at a pediatric hydrocephalus surgery training center in subSaharan Africa.

**Background:** Epilepsy is the most common neurologic condition in the world, with a disproportionate burden of disease in low and middle income countries. Appropriately-selected drug-resistant epilepsy patients with lesional epilepsy have the chance of a cure with surgery.

**Methods:** An established, accredited United States electroencephalography training program was modified for web-based, real-time video-conferencing, and hands-on training in Uganda. Development, implementation, and preliminary results of this pilot program to diagnose, identify, and treat pediatric patients with drug-resistant epilepsy were tracked and descriptive narratives provided.

**Results:** A local needs assessment revealed > 500 patients on at least one anti-seizure medication without no prior electroencephalogram (EEG). Through global initiatives by ASET The Neurodiagnostic Society, online electroencephalography training was conducted for a cohort of 10 participants in Mbale, Uganda. EEG instructors with 10 years of experience in an accredited apprenticeship training program in Chicago, USA taught the interactive Zoom-based curriculum over 6 months. Regular knowledge- and skills assessments were conducted, and progress tracked with EEG recording, troubleshooting, and interpretation. Ugandan patients for epilepsy surgery conference discussion were identified by the team in Uganda and discussed on video conference with the multidisciplinary team at the US partner program with ongoing peer mentorship and collaboration. Three pediatric neurologists in the country of 24 million in Uganda have also joined the neurosurgeon-driven program. Metrics with the process of surgical candidate identification, intervention, and epilepsy outcomes are tracked over time.

**Conclusions:** Global pediatric neurosurgery extends to development of a scalable, sustainable, peer-mentored pediatric epilepsy surgery program. The work is ongoing for knowledge and skill transfer: this model holds potential to address the disease burden of epilepsy and help elevate quality of life for patients, families, and communities.

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## Spine

Oral presentation

Evaluation of a large, monocentric surgical series of adult and pediatric Chiari type 1: do consensus documents fit everyday practice?

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**Objectives:** In a large monocentric surgical series of adult and children CM1 patients, we aimed to evaluate if the daily clinical practice reflects the consensus documents.

**Background:** Management of Chiari 1 malformation (CM1) and Syringomyelia (Syr) showed many changes in indications and techniques. The dedicated neurosurgical and neurological community recently analyzed the state of the art and find conduct uniformity. This led to international consensus documents (CCC 2019 Recommendations).

**Methods:** We retrospectively reviewed our series of 190 children and 220 adult CM1 patients submitted to surgery at our Institution from 2000 to 2021. The main indications for the treatment were the presence of Syr and symptoms related to CM1; a multidisciplinary team, comprehensive of neurosurgeons, pediatric and adult neurologists, orthopedics, neurophysiologists, and neuroradiologists, evaluated all 410 surgical cases, both before and after surgery, to share surgical indications and results.

**Results:** We observed a higher prevalence of surgical cases in adult females, while the incidence of symptomatic patients deserving surgery in children equally affected both sexes; the percentage of associated Syringomyelia was 68% in children and over 70% in adults; the association with Syndromes and other malformations was higher in the pediatric group (21% craniosynostosis, 13% hydrocephalus, 62% genetic syndromes). The outcome was pretty good, with a low complications rate (10%, but less than 3% deserving reoperation), slightly better in adults (>98% syrinx's shrinkage) than in children (95%).

**Conclusions:** While there is great correspondence with the statements derived from CCC 2019 documents about what to do for Syr and symptomatic CM1, the accordance was less evident in CM1 associated with craniosynostosis or hydrocephalus, in the early part of the series. However, we think that performing such studies could increase the homogeneity of surgical series, find a common way to evaluate long-term outcomes, and reinforces the comparability of different strategies adopted in referral centers.

## Global Neurosurgery

Oral presentation

### Secondary brain abscess after neurosurgical procedures (SBA): a 12-years retrospective analysis in a Brazilian tertiary hospital

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**Objectives:** Identify epidemiological aspects from patients with SBA attended in a Tertiary Hospital for neurosurgical prevention measures and outline the evaluation and multiprofessional management of these patients based in a review of the literature.

**Background:** SBA is an infrequent complication, but it is still challenging since it provides high morbidity and mortality, majority in immunocompromised as oncology patients. It's more frequent in young males, and the pathogen is identified in 68% of cases which *Staphylococcus aureus* (*S.aureus*) the most frequent germ. Therefore, It is relevant to recognize its epidemiological profile to optimize its management and prevention.

**Methods:** Retrospective analysis of patients with brain abscess drainage after performing a neurosurgical procedure were identified through medical records between March 2011 and March 2023 in a total of 9622 surgeries in Tertiary Hospital in São Paulo, Brazil.

**Results:** Total SBA drained were 138 (1,43% - Supratentorial) and 66.6% male. The average age was 41.1 years. Emergency brain surgeries were 86.9% in which 28.9% underwent Decompressive Craniectomy after trauma followed by Cranioplasty with Methylmethacrylate Plate, and 50% of the elective procedures were Brain Tumors removals which corresponded to all the study deaths (5.7%). Abscess pathogens were identified by culture in 26% of the cases which *S. aureus* being the majority (66.6%). The antibiotic therapy used were Meropenem and Vancomycin, with an average therapy duration of 17.5 days and hospital staying 27.3 days.

**Conclusions:** SBA is uncommon, requires an interprofessional review of strategies for improving care coordination and occurs mainly in young male after decompressive craniectomy for brain trauma. The culture has low diagnostic sensitivity in which *S. aureus* is the most common germ identified. Although the morbidity rate is high since the hospital staying and antibiotic therapy duration is long, the mortality is low once all deaths in the study were of patients immunocompromised with brain tumors.

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## Paediatric

Oral presentation

Hindbrain herniation as a criteria for fetal myelomeningocele repair: a natural history study

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### Objectives:

- Report the outcomes of myelomeningocele without hindbrain herniation.
- Discuss whether these patients should be considered candidates for fetal repair.

**Background:** The MOMS trial established the utility of *in utero* myelomeningocele closure in preventing hydrocephalus and preserving motor function. In the trial, radiographic hindbrain herniation was an inclusion criterion to select for open neural tube defects with risk of *in utero* deterioration. In the years since the MOMS trial, several inclusion criteria have been broadened, but the outcomes of myelomeningocele without hindbrain herniation are not well characterized.

**Methods:** This was a retrospective cohort study of all patients with open neural tube defect, without hindbrain herniation on prenatal ultrasound, treated at a single institution since December 2011. Based on MOMS trial criteria, these patients were not candidates for fetal intervention and underwent standard post-natal repair. We evaluated for decline in motor function between prenatal imaging and birth, based on movement on MRI and US prenatally compared to their postnatal neurologic exam. We defined hydrocephalus as the need for shunt or third ventriculostomy.

**Results:** Twenty-five patients with myelomeningocele without radiographic hindbrain herniation were screened for fetal intervention and ultimately underwent post-natal repair. In 9 cases, the highest level of the lesion was L2-L3; in 16, the highest level was L4-S1. No fetus had a decline in motor function between prenatal imaging and birth. 32% of children (8/25) were treated for hydrocephalus; of these, one had aqueductal stenosis and one did not meet MOMS criteria for hydrocephalus. By the MOMS trial criteria, the shunt rate was 25%.

**Conclusions:** The outcomes of myelomeningocele without hindbrain herniation are quite favorable without fetal intervention. Their motor deterioration and hydrocephalus risk appear similar to closed neural tube defects and do not seem to warrant fetal closure.

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## Oncology

ePoster presentation

### Giant cell tumor of the bone in the sacrum: a case report of a rare presentation and literature review

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**Objectives:** To report a rare case of Giant Cell Tumor of the Bone in the Sacrum.

**Background:** A 17-year-old female patient presented with lower back and sacral pain, without sensory or motor deficits. Computed tomography (CT) of the lumbosacral spine revealed an expansive lytic bone lesion with peripheral reactive sclerosis in the sacrum. Magnetic resonance imaging (MRI) showed an infiltrative sacral lesion with hypointensity on T1, intermediate signal on T2, and intense contrast enhancement, with invasion of the epidural space. Biopsy of the lesion confirmed a giant cell tumor of the bone.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2023 and a literature review.

**Results:** Giant cell tumors (GCTs) are rare and account for 8 to 10% of primary benign bone tumors. They have a higher prevalence in the 3rd and 4th decades of life and a slight predilection for females. GCTs predominantly affect long bones and, less commonly, the spine, pelvis, and sacrum. They can be associated with pseudotumoral conditions and metastases (10%), particularly to the lungs, and local recurrence, with pain being the main symptom. Imaging studies demonstrate a solitary lytic lesion with cortical thinning or erosion and invasion of the vertebral canal. The treatment of choice for GCTs is surgical, with complete resection. However, when located in the dorsal spine and sacrum with extensive destruction, as in the described case, surgical options are limited due to motor damage, sphincter incontinence, perineal anesthesia, and decreased quality of life.

**Conclusions:** Sacral GCT is rare, and its treatment is complex due to the difficulty in surgical resection and poor response to other therapeutic options. Challenges associated with this tumor include controlling its growth and managing pain.



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## Endovascular Neurosurgery

Oral presentation

Application of SQUIRE-compliant to intracranial aneurysm to improve the patient management decision making quality for surgical clipping versus endovascular coiling

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**Objectives:** The study aimed to appraise the clinical, locational, and morphometric factors included in the decision-making for clipping or coiling intracranial aneurysms (IAs).

**Background:** Rupture of intracranial aneurysm results in a potentially life-threatening subarachnoid hemorrhage. Aneurysms with wide necks are the most difficult to treat with the endovascular method. Thus, usually required surgical management. Meanwhile, posterior circulation aneurysms are more suitable for coiling than clipping.

**Methods:** In this single-center retrospective study, 394 patients with 435 intracranial aneurysms were screened between January 2013 and December 2022 at the authors institution. All the included patients were diagnosed with IAs on the three-dimensional rotational angiography. The means were compared with a t-test. The multivariate cox regression and stepwise logistic regression analyses were used to determine, between the groups, the differences among the factors of decision-making for clipping or coiling intracranial aneurysms.

**Results:** We depicted 312 (71.7%) and 123 (28.3%) anterior cerebral circulation IAs and posterior cerebral circulation IAs respectively. Ninety-four-point five percent (n=411) were saccular aneurysm, 13 (3%) were giant aneurysm, and 11 (2.5%) were fusiform. Sixty-five-point five percent (n=285) were clipped whereas 34.5% (n=150) underwent coiling. Multiple factors (age, location, type, size, dome-to-neck ratio, and aspect ratio) were found to influence the quality-improving decision-making for surgical clipping or endovascular coiling of IAs. There was no statistically significant difference found regarding factors like clinical presentations. There was a significant difference ( $p < 0.001$ ) between the aneurysmal morphometric factors for clinical decision of coiling (58% vs 42%) or clipping (78.9% vs 21.1%) of the anterior and posterior cerebral circulation IAs respectively, with an Odds ratio 2.72; 95%CI [1.76 – 4.18].

**Conclusions:** Despite the management of IAs over many decays, patients and aneurysm-related factors are reliable indicators for management decision-making quality for surgical clipping versus endovascular coiling of IAs.

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## Oncology

ePoster presentation

### Primary central nervous system melanoma: a rare case report and literature review

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**Objectives:** To report a rare case of primary central nervous system melanoma.

**Background:** A 69-year-old female patient presented with recent onset of mental confusion, accompanied by headache, nausea, and vomiting. No dermatological lesions were observed. Magnetic resonance imaging (MRI) revealed an intra-axial cerebral expansive lesion in the region of the corpus callosum and septum pellucidum, well-demarcated, isointense in T1 with a hyperintense peripheral portion showing heterogeneous contrast enhancement, hypointense in T2, and mild perilesional edema. These findings suggested a secondary expansive lesion. Complete surgical resection of the lesion was performed, which exhibited nodular segments with a brownish and dull surface, firm and elastic characteristics. Immunohistochemistry revealed positivity for SOX10 and MELAN-A, confirming the diagnosis of melanoma.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2023, along with a literature review.

**Results:** Primary intracranial melanomas (PIMs) are rare, accounting for 0.07% of all brain tumors and approximately 1% of all melanoma cases. They are more prevalent in males. In the central nervous system, PIMs originate from melanocytes in the parenchyma and leptomeninges, with PIMs primarily derived from leptomeningeal melanocytes in the cervical spinal cord or skull base. They are classified into four categories: (1) meningeal melanosis of the spinal cord or brain correlated with cutaneous pigmentation, (2) isolated primary cerebral melanoma, (3) discrete spinal melanoma, and (4) diffuse leptomeningeal melanomatosis. The most common clinical manifestation is intracranial hypertension (43%), followed by neurological dysfunctions (35%), seizures, or subarachnoid hemorrhage (16%). The primary treatment approach involves complete resection combined with adjuvant therapy.

**Conclusions:** The diagnosis of PIM, in the absence of cutaneous melanosis, poses a challenge and often becomes a diagnosis of exclusion. The prognosis of PIM following complete resection is better than that of metastatic melanoma. Radiotherapy, chemotherapy, and immunotherapy remain important adjunctive treatments.

## Skull Base

ePoster presentation

### Long-term tumor control in Koos Grade IV vestibular schwannomas without the need for gross-total surgical resection

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**Objectives:** We present the results of our prospective cohort of Koos IV VS patients than underwent less-than-total resection between January 2009 and December 2019 and discuss the present evidence on this controversial subject.

**Background:** The modern management of patients with Koos grade IV vestibular schwannomas (VS) aims at functional preservation and long-term tumor control. Gross-total tumor removal (GTR) leads to optimal tumor control but frequently also to permanent facial palsy. Subtotal (STR) or near-total (NTR) surgical removal followed by a “wait and scan” protocol and second-line stereotactic radiosurgery (SRS) in case of progressive remnants yields excellent tumor control rates with less permanent morbidity.

**Methods:** The cohort was followed-up with annual clinical and volumetric outcome analyses after standardized magnetic resonance imaging.

**Results:** Forty-eight patients were included in the analysis. The mean extent of resection was 87% (median 91%, range 45-100%), best fitting into the definition of STR rather than NTR. Thirty-four (71%) patients underwent a “wait-and-scan” protocol. Four-and-a-half years after surgery, 81% (n=39/48) of the tumor remnants regressed or were stable in size. The percentage of regressive tumor remnants increased over time. Nineteen percent (n=9/48) of the tumor remnants displayed volumetric progression; higher post-operative volume showed a linear correlation with higher volumetric progression (factor 1.96, 95%-CI 1.67-2.30, p=<0.001). SRS was performed in 21 patients (29%), 12 of which (86%) responded with postradiation pseudoprogession, resulting in an overall tumor-control rate of 96%. After 4.4 years F/U from the initial surgical resection, 92%.

23 of the patients had a good facial outcome (HB 1-2), 6% had a fair facial outcome (HB III), and 2% a poor facial outcome (HB IV-VI). So far, there was no need for salvage surgery after SRS.

**Conclusions:** STR followed by observation and SRS in selected cases leads to better facial outcome and similar tumor control rates compared to GTR.

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## Spine

Oral presentation

From pain to pleasure: a case series on surgical management of debilitating sacral CSF cysts in women

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**Objectives:** Analyze clinical presentation, surgical findings, and outcomes of surgically managed symptomatic sacral extradural cysts. Evaluate the effectiveness of minimally-invasive surgical exposure for ostium identification and direct closure in improving patient symptoms and preventing cyst recurrence. Advocate for treatment in an often underserved patient population.

**Background:** Tarlov described perineural cysts as arising from within a nerve root, with nerve fibres incorporated in the cyst capsule. A less well-known type of sacral extradural cyst may arise adjacent to nerve roots, displacing the surrounding structures. Large sacral extradural cysts can cause debilitating symptoms. Optimal management remains controversial and these patients are often undertreated.

**Methods:** A retrospective analysis was conducted on consecutive surgically-managed symptomatic sacral extradural cysts in seven female patients (mean age 37.7) at our institution. Imaging, surgical videos, pathology specimens, and charts were reviewed to illustrate the spectrum of clinical presentation and associated surgical findings. Post operative symptomatology and radiographic outcomes were reviewed.

**Results:** Presenting symptoms (mean duration 8 years) included sacral radiculopathy, dyspareunia, numbness and sphincteric disturbance. Intraoperatively, CSF cysts were identified and a clear ostium amenable to direct suture closure was located, often accompanied by a traversing vessel. In most cases, cysts were under high pressure. Pathology suggests these are not classic Tarlov cysts. At the last follow-up (mean 20 months), all patients reported satisfactory symptom improvement, and no cyst recurrence was observed on follow-up imaging.

**Conclusions:** Intraoperative videos collected as a part of our case series may entice more surgeons to consider simplified surgical exposure for ostium identification and direct closure of large sacral extradural cysts. Using a minimally-invasive approach enables short hospital stays and quick post-operative recovery, and in our small case series, patients report sustained satisfaction with their respective outcomes. Promotion of an accessible and effective surgical management strategy for this contentious condition could alleviate suffering in carefully selected patients.

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## Neurovascular Surgery

ePoster presentation

Long-term efficacy of chlorhexidine-containing cutaneous dressings on silver-coated external ventricular drain associated infections - a 10-year before-and-after study

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**Objectives:** In a previous prospective randomized trial (NCT02078830), a significant reduction in bacterial cutaneous and silver-coated catheter colonization was detected. However, the study was underpowered to demonstrate an effect on the incidence of EVDAl.

**Background:** Dressings containing chlorhexidine-gluconate (CHX) lower the incidence of external ventricular drain (EVD)-associated infections (EVDAls).

**Methods:** Retrospective (2009-2013) and prospective (2014-2018) review of patients undergoing silver-coated EVD-insertion. The control group consisted of patients from January 2009 to October 2013, where the CHX-dressings were not in use. The study group consisted of patients between February 2016 and December 2018, where CHX-dressing was standard of care. Primary endpoint was the diagnosis of EVDAl. Comparisons were made using the Chi-squared test, associations using multivariable logistic regression analysis. Statistical significance was set at  $P \leq .05$ .

**Results:** 258 out of 362 (72%) patients were eligible for analysis, with 152 (59%) receiving a CHX-16 dressing while 106 (41%) did not. Overall EVDAl-rates (20/106 [19%] vs. 12/152 [8%],  $p=.009$ ), the prevalence per 100 persons (19 vs. 8) and the incidence per 100 EVD-days (1.99 vs. 0.88) were halved after the introduction of the CHX-dressing, resulting in an absolute risk reduction of 11% and a number needed to treat of 9. Less permanent cerebrospinal fluid diversion procedures due to postinfectious hydrocephalus were necessary (7/106 [7%] vs. 6/152 [4%]). The application of a CHX-dressing was independently associated with a reduced risk of EVDAl (estimate -0.880 [standard error 0.41],  $p=.033$ ).

**Conclusions:** CHX-dressings as a standard of care for the exit site of EVD significantly reduce the occurrence of EVDAl.

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## Spine

ePoster presentation

### Comparative analysis of three cervical vertebral bone quality score methodologies and their correlations to the Lumbar Vertebral Bone Quality Score

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**Objectives:** We present the first analysis comparing these scoring methods to the well-validated VBQ score.

**Background:** Common complications after spinal fusion, such as pseudoarthrosis, cage subsidence, or instrumentation failure, are affected by the patient's bone quality. The cervical vertebral bone quality (C-VBQ) score, a magnetic resonance imaging-based adaptation of the lumbar vertebral bone quality (VBQ) score, was developed by three separate research groups simultaneously to evaluate bone quality in cervical spinal fusion patients.

**Methods:** A retrospective analysis of data for consecutive patients who underwent spine surgery at a single institution was completed. The VBQ score was calculated using the Ehresman et al. method. The C-VBQ scores, named according to placement of the region of interest within the cerebral spinal fluid, were calculated separately using the methods of Soliman et al. (C2-VBQ), Razzouk et al. (C5-VBQ), and Huang et al. (T1-VBQ). Linear regression models were utilized to evaluate correlations to the VBQ score.

**Results:** A total of 105 patients were identified (mean age, 57.0±11.9 years; women, 50.5%). Mean scores were C2-VBQ, 2.37±0.55; C5-VBQ, 2.36±0.61; and T1-VBQ, 2.64±0.68. The C-VBQ scores for the C2 level were significantly higher than those for the C3-C6 levels (3.18±0.96 vs. 2.63±0.77, P<.001), whereas the C7 level was found to have significantly lower C-VBQ scores (2.42±0.78 vs. 2.63±0.77, P=.04). The C2-VBQ (r=0.63) score had the strongest correlation to the VBQ score, compared to the C5-VBQ (r=0.41) and T1-VBQ (r=0.43) (P<.001).

**Conclusions:** This study demonstrates that the C2-VBQ had the strongest correlation to the lumbar VBQ score among all the C-VBQ scores.

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## Spine

ePoster presentation

A novel technique for the management of type 3-A C2 injury associated with a C1-C2 rotatory subluxation

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**Objectives:** The purpose of this case report is to provide the clinical presentation and management for a patient with type 3-A C2 injury associated with a C1-C2 rotatory subluxation treated by C2 translaminar screws with C1 hooks fusion.

**Background:** The atlantoaxial (C1-C2) complex is a different unit from the rest of the cervical spine because of its mobility and its bony and vascular anatomy. Its rotatory subluxation caused frequently by trauma can be life threatening if not treated. Since the beginning of the 20th century, several surgical techniques have been developed to fix the C1-C2 complex rotatory subluxation.

**Methods:** We report the first case of a patient who was treated for a type 3-A C2 injury associated with a C1-C2 rotatory subluxation by a posterior atlantoaxial fusion using bilateral C1 hooks and C2 translaminar screws.

**Results:** A 32-year-old doctor was transferred to our emergency department in October 2021 following a traffic accident. The patient had an isolated neck pain without motor or sensitive deficit. He was immobilized by a cervical collar and had an emergent spinal CT scan which revealed a type 3-A C2 injury associated with C1-C2 rotatory subluxation without bony fracture.

The patient underwent a posterior atlantoaxial fusion using C2 translaminar screws combined with a bilateral C1 hooks without bone grafting. The surgery and post-operative course were uneventful.

He is symptom free with good quality of construct at most recent follow-up examination, two years post-operatively.

**Conclusions:** The fusion technique using bilateral C1 hooks combined with C2 translaminar screws can be used to fix a type 3-A C2 injury associated with a C1-C2 rotatory subluxation to avoid neurovascular risks.

1155

## Functional

Oral presentation

Spinal cord stimulation as an alternative treatment option to repeated spine surgeries in failed back surgery syndrome

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**Objectives:** In our study we examined if there is any correlation between the effectiveness of spinal cord stimulation (SCS) and the number and type of spine surgeries in failed back surgery syndrome (FBSS).

**Background:** FBSS can be seen in 5-40% of patients who underwent spine surgeries. A common choice of treatment is extended spine surgery, such as multilevel vertebral fusions. Despite the optimal anatomical reconstruction of the spine, the vast majority of these patients suffer from chronic pain. SCS is an effective symptomatic treatment in chronic pain syndromes. FBSS patients are ideal candidates for SCS therapy.

**Methods:** Patients who were treated with SCS in our Department from 2010 were included in the study. From 115 patients, a total of 72 were enrolled. The number and type of spine surgeries and the pre- and postimplantation VAS and ODI were collected. The follow up period was at least one year.

**Results:** 24,5% of the patients had one, 39,6% had two and 35,8% had three or more spine surgeries. 66% of the surgeries were vertebral fusion. There were a significant improvement in VAS (9,1 vs 2,9) and ODI (54% vs 18%) after SCS implantation. Pre- and postimplantation VAS was 8,8 vs 2,3 and ODI was 51% vs 12% if the patients had less than 3 surgeries. In contrast, VAS was 9,2 vs 3,6 and ODI was 56% vs 20% if the patients had more than 3 operations.

**Conclusions:** SCS is a very effective therapy in FBSS and has better results if the patient had less than 3 spine surgeries. Therefore, according to our results, SCS should be considered instead of repeated spine surgeries if the patient shows symptoms of FBSS after the first or second operation.



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## Neurovascular Surgery

Oral presentation

Jugular venous compression syndromes of the skull base and subcranial space: current appraisal of an evolving class of clinical entities

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**Objectives:** To describe progress in identification and classification of cerebral venous obstructive disorders and share recent work defining related clinical entities.

**Background:** It has been increasingly recognized that some forms of intracranial hypertension (including subvariants of pseudotumor cerebri) may be due to identifiable insufficiency of venous drainage, most notably venous sinus stenosis which may be amenable to endovascular stenting. More recently, subcranial stenosis caused by compression of the jugular vein between the styloid process and C1 (styloidogenic jugular venous compression syndrome - SJVCS) has been identified as another source. However, more sources have been identified, many of which have not been previously recognized.

**Methods:** We examined all of the modes of subcranial venous compression that have been identified as a cause of cerebral venous hypertension through review of the literature and discussion with experts, including the new working group formed through the Society of NeuroInterventional Surgery (SNIS) in the USA.

**Results:** A number of novel forms of venous insufficiency caused by compression and/or occlusion of venous drainage pathways for the cerebral circulation have been defined. There are many possible forms, with the unifying principle being sufficient obstruction to cause elevation of intracranial venous pressure and delay venous drainage.

**Conclusions:** The understanding of venous insufficiency as a cause of intracranial hypertension is still in its infancy. There is increasing agreement in the neurovascular community that these are valid clinical entities which at the moment are incompletely defined. A new preliminary classification system is being developed and proposed to aid in research in this area, which will be presented.

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## Oncology

ePoster presentation

### Evaluation of treatment of large metastatic scalp lesions

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**Objectives:** To present a case series of large metastatic scalp lesions, analyzing the clinical aspects and the surgical nuances required to optimize the treatment.

**Background:** Metastases in the cranial vault and scalp are rare, mainly occurring through hematogenous dissemination via branches of the external carotid artery. Data regarding the treatment of broad lesions invading the intracranial compartment is barely found in the literature. Most scientific reports suggest that treatment should be individualized, emphasizing maximal safe resection combined with cutaneous flaps and bone reconstruction. Additionally, adjuvant radiotherapy may benefit some patients.

**Methods:** The authors present a retrospective analysis of a case series operated between 2011 and 2022 in a tertiary University Hospital in São Paulo-Brazil, focusing on the clinical aspects and the multidisciplinary approaches employed for surgical management.

**Results:** Seven cases were reported, with 4 having a previous oncological diagnosis and the others diagnosed primarily based on the secondary lesion. Each patient underwent an individualized and multidisciplinary approach based on the extent of the lesion and the involvement of adjacent structures.

**Conclusions:** Large metastasis in the cranial vault and scalp are rare lesions that require individualized treatment, aiming for a maximal safe resection and better-increased quality of life. Adjuvant radiotherapy may benefit some patients, considering the significant risk of operative wound dehiscence in this subgroup. The treatment aims to achieve local disease control, improve quality of life, prevent secondary infection, and increase survival rates.

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## Spine

ePoster presentation

Intraoperative intracranial hemorrhage during seemingly uncomplicated spine surgery: a coincidental event or a yet unrecognized complication?

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**Objectives:** To report two cases of intraoperative intracranial hemorrhage (ICH) unexpectedly occurring during uncomplicated spine surgery.

**Background:** Intraoperative ICH is not a typical complication of spine surgery. The rare (<1%) occurrence of ICH during or after spine surgery has generally been attributed to excessive intraoperative cerebrospinal fluid (CSF) losses, as occurs for instance after unintended durotomy, or to acute hypertensive episodes.

**Methods:** Two case reports and literature review.

**Results:** Both patients underwent successful and seemingly uncomplicated spine surgeries, including instrumented fusion, under total intravenous anesthesia, without any significant intraoperative CSF losses or hypertensive episodes. Both patients failed to emerge from general anesthesia in an appropriate and timely fashion, exhibiting symptoms and signs of brain herniation. They underwent emergency cerebral imaging and were found to have unexpected ICH, necessitating emergency decompressive surgery. Both patients recovered poorly and ultimately died in the early postoperative period.

**Conclusions:** Though exceedingly rare, intraoperative ICH is a serious, potentially fatal complication of spine surgery. Patients who fail to emerge from general anesthesia in a timely fashion after spine surgery should undergo immediate brain imaging, so that surgical decompression can be offered without unnecessary delays. The exact mechanisms underlying this extremely rare complication remain unclear.

## Oncology

Oral presentation

Life-style, reproductive and metabolic factors and risk for meningioma in women: a prospective population-based study (COhort of NORway)

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**Objectives:** The aim of this study was to assess life-style, reproductive and metabolic factors for meningioma risk in women.

**Background:** Obesity is considered a risk factor for development of meningioma. Obesity is also the clinical hallmark of metabolic syndrome, characterized by glucose intolerance, dyslipidaemia and hypertension. Although a large body of studies describe the association between body mass index and meningioma risk, few data exist exploring underlying metabolic dysfunction.

**Methods:** The Cohort of Norway (CONOR) is a nationwide health survey, conducted between 1994 and 2003, including anthropometric measures, blood tests and health questionnaires. Linkage to the National Cancer Registry enabled identification of incident meningioma during follow-up until December 2018.

**Results:** 81 652 women were followed for a total of 1.5 million years and 249 incident meningiomas were identified. Diabetes (HR 2.36; 95% CI 1.48-3.77), hypertension (HR 1.38; 95% CI 1.03-1.84) and increasing LDL levels (HR 1.14; 95% CI 1.01-1.30) seemed to increase meningioma risk, but not obesity alone (HR 1.22; 95% CI 0.84-1.75). High level of physical activity (HR 0.56; 95% CI 0.33-0.94), parity >1 child (HR 0.66; 95% CI 0.44-1.00) and alcohol consumption >1 times per week (HR 0.36; 95% CI 0.18-0.75) were negatively associated with meningioma risk. Participants without any metabolic dysfunction had a reduced meningioma risk, while participants with all 5 metabolic factors present, had a 4-fold risk increase for meningioma (HR 4.28; 95% CI 1.34-13.68).

**Conclusions:** This comprehensive prospective cohort study provides further insight into risk factors for meningioma development, in particular metabolic dysfunction.

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## Trauma

Oral presentation

Floating decompressive craniotomy - an alternative to decompressive craniectomy in a selected subgroup of patients – a mono-institutional prospective study

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**Objectives:** The objective of this study was to compare floating decompressive craniotomy (FDC) with decompressive craniectomy (DC) and demonstrate that FDC is an effective alternative to DC in a selected subgroup of patients with a less significant space-occupying lesion.

**Background:** Decompressive surgery is usually carried out using decompressive craniectomy. After craniectomy it is necessary to perform cranioplasty, which is accompanied by a number of complications. Floating decompressive craniotomy could be an alternative to decompressive craniectomy. A floating bone flap and duraplasty provide expansion potential whilst obviating the need for cranioplasty in the future.

**Methods:** We evaluated a prospective group of 33 FDC patients along with a retrospective control group of 33 DC patients. The representation of space-occupying lesions was the same in both cohorts (traumatic brain injury – 25, intracerebral hemorrhage – 4, subarachnoid hemorrhage – 2, malignant infarction – 2).

**Results:** No significant differences were identified in baseline demographics, timing of the surgery, reoperation for persistent intracranial hypertension or postoperative ICP between FDC and DC groups. Both methods resulted in adequate control of ICP. In the FDC group the following were detected: borderline significant higher initial motor GCS ( $p=0,06$ ), lower incidence of preoperative anisocoria ( $p=0,0013$ ), a lower Rotterdam score ( $p=0,0002$ ), lower incidence of postoperative complications ( $p=0,0267$ ), shorter hospital stay ( $p=0,0248$ ), stay at the ICU ( $p=0,0198$ ), mechanical ventilation period ( $p=0,0009$ ) and better six month clinical outcome ( $p=0,0025$ ). FDC was more often accompanied by malfunction than DC, but the difference was not statistically significant ( $p=0,1697$ ).

**Conclusions:** Floating decompressive craniotomy is the effective alternative to decompressive craniectomy in the subgroup of patients with a less significant space-occupying lesion.

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## Trauma

Oral presentation

### Neurotrauma from fall accidents in Ethiopia

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**Objectives:** Our objective is to determine the common fall types causing neurotrauma and death.

**Background:** Ethiopia is a fast-growing economy with rapid urbanization and poor occupational safety measures. Fall injuries are common and frequently result in traumatic brain injury (TBI) or spinal cord injury (SCI).

**Methods:** We prospectively included fall victims who were hospital-treated for neurotrauma or forensically examined in 2017 in Addis Ababa, Ethiopia. We registered sociodemographic factors, fall types, injuries, treatment, and outcome.

**Results:** We included 117 treated and 51 deceased patients (median age 27 vs. 40 years). Most patients were injured at construction sites (39.9%) and only one in three used protective equipment. TBI (64.7%) and SCI (27.5%) were the most common causes of death among the deceased patients, of which most died at the accident site (90.2%). Many patients suffered significant prehospital time delays (median 24 hours). Among treated patients, SCI was more frequent than TBI (50.4% vs. 39.3%), and 10.3% of the patients had both SCI and TBI. Most SCIs were complete (49.3%), whereas most TBIs were mild (55.2%). Less than half of TBI patients and less than one in five SCI patients were operated. There were twice as many deaths among TBI patients as SCI patients. Among those discharged alive, at a median of 33 weeks, 50% of TBI patients had a good recovery whereas 35.5% of SCI patients had complete injuries.

**Conclusions:** Falls at construction sites with inadequate safety measures were common causes of SCI and TBI resulting in severe disability and death. Treatment outcome at follow up for neurotrauma due to fall accidents is promising. These results support further development of prevention strategies and neurotrauma care in Ethiopia.

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## Oncology

ePoster presentation

### Metformin in high-grade glioma: a systematic review and meta-analysis

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**Objectives:** Evaluate overall survival (OS) in patients with HGG treated with TMZ+MET versus TMZ alone.

**Background:** High-grade gliomas (HGG) are aggressive tumors known for their poor prognosis. Despite research into its molecular and clinical aspects, current management minimally impacts survival. It remains unclear whether combining Temozolomide (TMZ) with Metformin (MET) enhances survival in this population.

**Methods:** We systematically searched Pubmed, Embase, and Cochrane Library databases for studies comparing TMZ+MET vs. TMZ alone for HGG and reporting OS. Heterogeneity was examined with I<sup>2</sup> statistics. Statistical analysis was performed using Review Manager 5.4.1. Outcomes were pooled with a random-effects model.

**Results:** We included 13 studies in the systematic review comparing TMZ + MET vs. TMZ alone for the treatment of HGG. OS was reported for all studies; however, the meta-analysis could only pool the data for 4 studies due to absence of standard deviation results from other studies. Average follow-up ranged from 18 months to 88 months. Among the 13 studies, OS was significantly improved with the combination of TMZ + MET in 10 studies. The meta-analysis of 4 studies included 2,970 patients, of whom 2,730 (91%) underwent treatment with TMZ+MET. Patients with TMZ+MET had significantly better OS rates as compared with patients on TMZ alone (HR 0.72; 95% CI 0.58, 0.93; p=0.01; Figure 1). There was no significant difference between groups in the outcome of progression-free survival (HR 0.84; 95% CI 0.67, 1.05; p=0.13; Figure 2). Of note, there were only 3 studies in the outcome of progression-free survival, which may have limited the statistical power to detect a significant difference.

**Conclusions:** This systematic review and meta-analysis present compelling evidence regarding the beneficial effects of TMZ+MET in patients diagnosed with HGG relative to treatment with TMZ alone, significantly improving overall survival.

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## Oncology

ePoster presentation

Supratentorial intraparenchymal schwannoma of brain: case report and review of literature

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**Objectives:** To study the natural history and course of this rare variety of brain tumor.

**Background:** Intraparenchymal schwannoma of brain is a rare entity amongst the brain tumor.

**Methods:** Natural history, operative details and course of the disease in our patient is depicted and discussed.

**Results:** Intraparenchymal brain schwannoma is a benign tumor with indolent course and less instances of recurrence after complete removal.

**Conclusions:** Intraparenchymal brain schwannoma is a rare benign tumor with indolent course and less instances of recurrence after complete removal.



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## Spine

Oral presentation

Long term outcome of surgical management for vertebral hemangioma presenting with myelopathy

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**Objectives:** The aim of this study was to analyze the long-term outcome of patients of vertebral hemangioma presenting with myelopathy who were managed in a resource- constrained environment, the majority of whom were treated by our novel three-pronged strategy of alcohol injection, posterior decompression, and short segment fixation.

**Background:** Vertebral hemangiomas are benign, highly vascular lesions of the vertebra. Asymptomatic hemangiomas are common, but they rarely enlarge in size and present with myelopathy.

**Methods:** All patients of symptomatic vertebral hemangioma with myelopathy treated at our hospital from 2001 to 2015 with follow up till January 2018, with at least 2 year follow up were included. The operative procedure, blood loss and complications were recorded. Clinical outcomes were measured using ASIA score.

**Results:** Out of 60 patients operated, 44 (26 males, 18 females) fulfilled the inclusion criteria. 41 hemangiomas were located in the thoracic spine two in lumbar spine and one in cervical spine. Upper thoracic spine involvement was more common than lower thoracic spine involvement. Mean age was 29.34 years (range 10 - 68 years). Mean follow up was 74.63 months (range 24 - 180 months). All patients had improvement in motor strength postoperatively. Local pain, which was present in two patients resolved, bladder symptoms present in 13 patients also resolved.

**Conclusions:** Our experience in treating symptomatic vertebral hemangiomas, along with the long term follow up data suggests that good postoperative results can be achieved with minimal complications, in carefully selected patients.

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## Trauma

ePoster presentation

Factors associated with hospital outcomes in patients with penetrating gunshot craniocerebral injuries in armed conflicts areas in DRC

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**Objectives:** Identify the factors which were associated to poor outcome for patients with penetrating gunshot injuries in the armed conflict area of DRC.

**Background:** Penetrating craniocerebral injuries (PCCI) are types of open head injuries caused by sharp objects or missiles, resulting in communication between the cranial cavity and the external environment. This condition is deemed to be more prevalent in armed conflict regions where both civilians and military are frequently assaulted on the head, but paradoxically their hospital outcomes are underreported.

**Methods:** We conducted a retrospective study of patients admitted at the Regional Hospital of Bukavu, DRC, from 2010 to 2020. We retrieved medical records of patients with PCCI operated in the surgical departments. A multivariate logistic regression model was performed to find associations between patients' admission clinico-radiological parameters and hospital outcomes. Poor outcomes was defined as a Glasgow Outcomes Score less than 4.

**Results:** There was a total of 91 patients with PCCI. Only 69 patients had relatively satisfactory medical records. The prevalence of PCCI was 9.1% (91/858 cases) among admitted TBI patients. 36.2% of patients were admitted with GCS < 13, and 40.6% of them were unstable hemodynamically. Hemiplegia was found in 23.1% on admission. Eight patients had an intracerebral hemorrhage. Among the 69 operated patients, complications, mainly infectious, occurred 50.7%. Poor hospital outcomes were observed in 30.4% and associated with an admission GCS < 13, hemodynamic instability, intracerebral hemorrhage, and hemiplegia ( $p < 0.05$ ).

**Conclusions:** The factors associated with poor hospital outcomes of patients with PCCI in armed conflicts region are hemodynamic instability, admission GCS < 13, the presence of intracranial hemorrhage, and hemiplegia. In the postoperative period, patients with PCCI frequently developed complications, especially infectious. The poor outcomes may be improved by strengthening the local capacity in the acute care management of trauma patients.

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## Epilepsy

Oral presentation

Bridging pediatric epilepsy surgery with basic science: from sEEG to intracellular recordings

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**Objectives:** In this study, we performed electrophysiological recordings on acute slices from pediatric patients to better understand the physiopathology of epileptogenic zone.

**Background:** Pre-surgical evaluation from refractory pediatric epileptic patients is crucial in order to identify epileptogenic zone (EZ) and increases the chances of post operative seizures free. However the complexity of an epileptic circuitry remains unclear. High frequency oscillations (HFOs) expressed during sEEG recordings are commonly used as biomarkers to identify EZ.

**Methods:** Electrophysiological recordings were performed in acute slices from surgical resections containing maximal HFOs recorded in sEEG evaluation from pediatric patients with refractory epilepsy. Spontaneous excitatory post-synaptic currents (sEPSCs) and spontaneous seizures like events (sSLEs) were analyzed. Immersion chamber bath application of in vitro pro-convulsivants (e.g. 4-aminopyridine (4AP) and bicuculline methobromide (BMO)) was performed to investigate pharmacological properties from induced interictal epileptiform discharges (IEDs).

**Results:** Abnormal trends of sEPSCs were recorded in 10 neurons and 10 sSLEs were identified in 9 other cells. Both sEPSCs and sSLEs were completely abolished by application of NBQX (5  $\mu$ M). Application of 4AP (150  $\mu$ M) and BMO (100  $\mu$ M) induced transient recurrence of GABA<sub>B</sub> outward currents (GABOCs; n = 55) before neuronal network synchronization and the generation of IEDs. GABOCs were completely blocked by the GABA<sub>B</sub> receptors antagonist CGP-55845 (10-20  $\mu$ M; n = 11). Levetiracetam (300-1200  $\mu$ M) reduced amplitude and frequency (n = 14) but failed to block IEDs and Lacosamide (200-800  $\mu$ M) strongly reduced (n = 4) and completely abolished (n = 16) IEDs.

**Conclusions:** Using sEEG for exact localization of EZ and target resection increases identification of sEPSCs and sSLEs electrophysiological *ex vivo* recordings, thus providing unique scenario for better epileptogenesis comprehension in pediatric epilepsy. GABOCs play a major role in neuronal network synchronization and cadence of IEDs. Lacosamide shows better effect in blocking IEDs compared to Levetiracetam.

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## Spine

Oral presentation

Characterizing the complication profile of spinal robotic systems: a MAUDE study

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**Objectives:** We aimed to quantify and classify complications of robotic devices using a national database.

**Background:** Pedicle screw placement in spinal surgery has evolved to incorporate greater degrees of technological guidance. In recent years, robotic machines have been used to increase precision, accuracy, and overall patient safety in screw placement. However, there are few studies dedicated to investigating the complications of robotic-assisted spine surgeries.

**Methods:** The Manufacturer and User Facility Device Experience (MAUDE) was queried for adverse events involving the most widely used robotic spine devices from inception to 11/03/2021. Entries were characterized by assigning categorical variables based on event information, after which, descriptive analysis was performed.

**Results:** The query yielded 339 unique robotic failure events. The most frequent complications in robotic-assisted spinal surgeries were imprecision (73.6%), software errors (13.7%) and damaged or missing screws (4.9%). The Mazor X™ system had the greatest representation (71.6% of events). Most errors were able to be resolved intraoperatively or continued through the employment of other conventional imaging methods and, overall, had low clinical significance on patients. Medial breaches were 1.7x more common than lateral breaches. Adverse events resulted in delays greater than 1 hour 10.3% of the time. The vast majority of events occurred intraoperatively, after the initial incision was made (78.5%).

**Conclusions:** Imprecision and unresponsive software were found to be two of the most frequent complications of robotic-assisted spine surgery. Future, prospective research should aim to standardize investigations of robotic-associated complications as well as exploring interventions to remedy the common failure etiologies.

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## Skull Base

Oral presentation

When to fuse? Management of clival chordoma with extension to craniocervical junction in the setting of instability

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**Objectives:** The authors conducted a systematic review by querying three databases.

**Background:** Clival chordomas that involve the craniovertebral junction (CVJ) are particularly challenging to remove due to risk for postoperative atlantoaxial instability. Preoperative instability can also be present due to mass effect from the clival lesion. Surgery involves a delicate balance of acknowledging existing preoperative instability, when present, and aiming for gross total resection (GTR) while determining the optimal time to fuse occiput to axial spine. This requires extensive knowledge of operative anatomy, neuro-oncology, and spinal biomechanics.

**Methods:** We examined all currently available neurosurgical literature pertaining to skull base chordomas with extension to the craniocervical junction.

**Results:** Thirty studies featuring 435 patients (age range: 2-78 years) were identified, including 14 retrospective cohort studies, 6 case reports, and 3 case series describing surgical management with OCF. The remaining 7 studies (4retrospective cohort studies and 3 case reports) reported surgical management without OCF. Our findings indicate that cervical instability due to the fracture or loss of the odontoid process in the pediatric population is an indication for OCF. With respect to timing, it appears that OCF can be conducted prior to or following tumor resection if there is clinical suspicion that a patient will eventually develop atlantoaxial instability (odontoid process removal is an indication for OCF).

**Conclusions:** OCF is indicated for patients when concern for craniocervical instability exists. Although it can be performed following surgical chordoma resection, as long as such instrumentation does not interfere with achieving surgical goals of GTR and/or maximal safe resection, results suggest that optimal outcomes may be obtained when OCF precedes tumor resection. In addition to the degree of instability present, brain stem compression, extent of resection, and amount of instrumentation to be performed are factors that should be discussed between a skull base surgeon-spine surgeon multidisciplinary team.

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## Spine

ePoster presentation

### A comprehensive review of surgical interventions for arachnoid web fenestration

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**Objectives:** To characterize all current literature regarding arachnoid web treatment.

**Background:** Arachnoid webs are rarely described pathologies consisting of thickened arachnoid tissue leading to pain and myelopathy. It has been only minimally described in previous case reports and small retrospective series.

**Methods:** A systematic search was performed utilizing the PubMed, Embase and Cochrane Library databases for all patients undergoing treatment for arachnoid web. Articles were excluded if they did not describe individual patient outcomes.

**Results:** A total of 20 studies characterizing 41 unique individual patients were identified. The average follow up was 13.76 months (range: 0.00-80.00). There was a wide range of ages affected with a mean age of 54.41 years (range: 29.00-81.00). All arachnoid webs were localized to the thoracic and cervical spinal columns (85%, 15% respectively). Most were characterized by the presence of syrinx on MRI imaging (78%). The lower extremity was most affected (73%) with most patients having both motor and dorsal column symptoms. All patients had gradually progressing symptoms until surgery. A total of 98% of patients underwent operative laminectomy with an overall improvement rate of 73%. Five studies included the use of intraoperative ultrasound and zero studies utilized endoscopic technique.

**Conclusions:**

Arachnoid webs are rare causes of myelopathy that appear to be well treated with laminectomy and fenestration. Endoscopy could potentially be utilized as a new tool for performing complete fenestration and optimizing improvement of symptoms after surgery.

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## Education, Ethics, Socioeconomic

ePoster presentation

The future of technology in medicine: from cyborgs to curing paralysis and beyond (insights gained from writing books during medical school)

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**Objectives:** After wrapping up a book on Alzheimer's disease, we turned our efforts toward writing our second book - "The Future of Technology in Medicine, From Cyborgs to Curing Paralysis".

**Background:** After having written two neuroscience-related books during medical school, myself and coauthors would like to take time to reflect on the value of the process (patient education), the inside scoop we learned, and the steps students can take to write and publish a book related to a personally important cause.

**Methods:** We would like to share the steps we took from ideation to publication with medical students.

**Results:** 1. Research topics that are familiar at baseline and cite references from any resources used (similar to writing a clinical neurosurgery paper). Less important is the topic than the ability of the writer to convey medical concepts in an easy-to-digest manner to the lay community. 2. Search for a publisher and submit a brief proposal. Normally, the publisher will request reviewers to assess the outline and summary. 3. If the concept proposal and outline are approved, there is no trick to writing books. Open up your Word browser and type away. Don't worry about formatting, as the publisher will format, proof, and copy edit your draft. 4. Stick with it, team up with 2-3 colleagues if needed to produce a nice comprehensive reference book. 5. It is good strategy and respectful to include a neurosurgeon as senior author. 6. Have fun with Open AI in designing cover art and leverage the opportunity to form new connections when soliciting invites to write the foreword/introduction. 7. Discuss with publisher ahead of time regarding social media campaign launch and availability of the book in bookstores and online retailers. 8. Inquire regarding translation of the book to reach a global audience.

**Conclusions:** These are essential factors to keep in mind when writing a book - and impactful and gratifying process.

## Education, Ethics, Socioeconomic

ePoster presentation

A call for increased initiatives focused on machine learning to improve global stroke outcomes through imaging and covariate-based outcomes prognostication

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**Objectives:** The objective of this paper is to discuss the potential use of machine learning for predicting stroke and CVA.

**Background:** Machine learning has been widely used in healthcare to improve clinical decision-making. Two recent studies demonstrated the potential of machine learning in predicting aneurysmal rerupture and sudden cardiac death. However, there is currently no predictive modeling that incorporates both imaging and clinical covariates for prognostication of strokes and cerebrovascular accidents (CVA). This is important because stroke is the fourth most prominent cause of death in the United States, affecting up to 795,000 Americans each year, and is a global health concern.

**Methods:** We performed a systematic review of the literature to identify studies reporting any outcomes of stroke in low-income and lower-middle-income countries. Additionally, we queried the US Clinical Trials database to identify ongoing trials involving the use of machine learning involving imaging and clinical covariates for prognostication in stroke patients.

**Results:** Across six studies featuring 5265 patients from nations such as Ethiopia, Zambia, and Tanzania, only 48.37%(95% CI 38.59%–58.27%;  $I^2 = 97.0\%$ ,  $p < 0.01$ ) of stroke patients presented to hospital within 1 day, and the pooled in-hospital mortality rate was 19.81%(95% CI 15.26%–25.31%;  $I^2 = 91\%$ ,  $p < 0.01$ ). This highlights the need for improved prediction of CVA both in the U.S. and globally, as prediction can help providers optimize limited resources. Lastly, query of the US Clinical Trials database reveals no ongoing trials studying the use of image-based prognostication.

**Conclusions:** Machine learning has the potential to revolutionize clinical decision-making in healthcare. Future collaborations among experts in the field are needed to develop accurate prognostic models for stroke and cerebrovascular accidents, which can greatly benefit neurocritical care and improve patient outcomes.



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## Paediatric

ePoster presentation

### Primary intra-axial lesions within the pediatric population: indications for multi-stage approaches to resection

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**Objectives:** We performed a systematic review to examine the unique surgical indications for staging, timing between stages, specific surgical approaches utilized, and postoperative publications for staged surgery for primary intra-axial neoplasms in the pediatric population.

**Background:** Multi-stage surgery for skull base lesions has been utilized to facilitate maximal safe resection and optimize outcomes while minimizing morbidity and complications. Conversely, staged surgery for primary intraparenchymal neoplasms is less commonly performed and has not been reported as extensively within the literature.

**Methods:** A literature search was conducted in August 2021 using PubMed, Web of Science, and Cochrane databases using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) recommendations. Titles and abstracts were evaluated independently by 2 authors, after which articles were selected for final analysis based on application of strict inclusion criteria during full text screen. Each included article was then qualitatively assessed and relevant variables—including operative approaches, timing, and outcomes—were extracted for synthesis.

**Results:** There were 17 pediatric patients, with 6 (35%) male, 5 (29%) female, and 6 (35%) unspecified sex patients. Age ranged from 18 months to 17 years (mean 9 years). Tumor pathologies consisted of 5 (29%) astrocytomas, 2 (12%) ependymomas, 2 (12%) teratoid rhabdoid tumors, 2 (12%) oligodendromas, 1 (6%) glioma, 1 (6%) dysembryoplastic neuroepithelial tumor, 1 (6%) meningioangiomas, 1 (6%) pleomorphic xanthoastrocytoma, 1 (6%) ganglioglioma, and 1 (6%) germ cell tumor. Primary sites of the tumor included 4 (24%) temporal lobe, 3 (18%) thalamic, 3 (18%) thalamopeduncular, 3 (18%) frontal lobe, 2 (12%) posterior fossa, 1 (6%) cerebral hemisphere, and 1 (6%) frontoparietal lobe. Three studies reported complications, including subtle hemiparesis, hydrocephalus, cranial nerve (CN) VI and VII palsies, truncal ataxia, and cerebellar mutism.

**Conclusions:** Staged approaches are more commonly reported in the pediatric population and utilized in resecting astrocytoma and glioma.

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## Education, Ethics, Socioeconomic

ePoster presentation

Machine learning made easy: proposal for a medical student educational session on high yield strategies learning and applying data science

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**Objectives:** This session would include a brief overview of machine learning models and the procedures for using the programming language of RStudio for the development of novel internet-based prognostication calculators. The benefit of RStudio is that it is user friendly and pre-designed templates are available that can enable students to perform facile customization in tailoring the code to the needs of their clinical investigation.

**Background:** Machine learning is a burgeoning field in data science that has many applications in medicine, and it is especially useful in neurosurgery due to the often-complex and potentially emergent nature of day-to-day cases. Machine learning models have the potential to deliver accurate patient prognostication while offering the benefit of providing real-time AI supported clinical decision-making with high data granularity. These models can utilize numerical inputs for more straightforward applications and, with practice, can enable clinicians and trainees to incorporate advanced imaging sequences as inputs to optimize the accuracy of patient prognostication. In the future, these models will become much more commonplace in the clinical setting for neurosurgeons. As medical school curricula do not typically incorporate these statistical techniques into biomedical statistics courses, symposia centered on machine learning could prove essential to medical students seeking to learn these skills.

**Methods:** There will be a brief overview of accuracy verification involving discussion of receiver operating curves with the use of training and testing datasets - the heart of machine learning.

**Results:** We have designed and outlined a curriculum that will enable students to identify and classify different techniques (support vector machines, logistic regression, clustering, nearest neighbor classifiers), and recognize the utility of machine learning approaches to neurosurgical outcomes prognostication.

**Conclusions:** Our hope is that students will leave this symposium well-equipped with a newfound confidence and the baseline conceptual framework needed to begin exploring the awesome world of machine learning throughout their training.

## Skull Base

ePoster presentation

### Extent of resection in clival chordoma and the current state of survival outcomes: systematic review and meta-analysis

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**Objectives:** We performed a systematic review and meta-analysis in order to profile surgical and survival outcomes for skull base chordoma.

**Background:** Despite their precarious behavioral classification (histopathologically benign (low-grade), behaviorally malignant), great strides have been taken to improve prognostication and treatment paradigms for patients with skull base chordoma. However, due to the rarity of this tumor, prior investigations remain limited to small retrospective series.

**Methods:** Fixed and random-effect meta-analyses were performed for categorical variables including number of males, GTR, STR, 5-year OS, 10-year OS, 5-year PFS, and 10-year PFS.

**Results:** Following the systematic search and screen, 47 studies published between 1993-2020 reporting data for 2204 patients remained eligible for analysis. Sex distribution was comparable between males and females, with a slight predominance of male-identifying patients (0.5625 [0.5418;0.3909]). Average age at diagnosis was  $42.4 \pm 12.5$  years, while average age of treatment initiation was  $43.0 \pm 10.6$  years. Overall, there was a substantial degree of heterogeneity across the 47 studies ( $I^2=56.3\%$  [44.0%; 65.9%]). With respect to operative margins, the rate of GTR was 0.3323 [0.2824; 0.3909],  $I^2 = 91.9\%$  [90.2%; 93.4%], while the rate of STR was significantly higher at 0.5167 [0.4596; 0.5808],  $I^2 = 93.1\%$  [91.6%; 94.4%]. Interestingly, 5-year OS rate was 0.7113 [0.6685; 0.7568],  $I^2 = 91.9\%$  [90.0%; 93.5%]. Furthermore, 10-year OS rate was 0.4957 [0.4230; 0.5809],  $I^2 = 92.3\%$  [89.2%; 94.4%], which was comparable to both 5-year PFS rate of 0.5054 [0.4394; 0.5813],  $I^2 = 84.2\%$  [77.6%; 88.8%] and 10-yr PFS rate of 0.4949 [0.4075; 0.6010],  $I^2 = 14.9\%$  [0.0%; 87.0%]. There were 55 reported deaths for a perioperative mortality rate of 2.5%. The most common complication was CSF leak(5.4%).

**Conclusions:** Overall, these results indicate good 5-year outcomes; however, 10-year prognosis for skull base chordoma remains poor due to its radiotherapeutic resistance and high recurrence rate.

## Paediatric

ePoster presentation

### Declining rates of anencephaly in Central and South American countries: 2000-2019

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**Objectives:** To analyze anencephaly mortality rates in major Central and South American countries from 2000 to 2019 by using the World Health Organization (WHO) mortality database.

**Background:** Anencephaly is a neural tube defect wherein a newborn is born with underdeveloped brain and possibly skull. It is a fatal condition that can be prevented through folic acid supplementation. Currently the only Central and South American country that mandates folic acid supplementation is Costa Rica.

**Methods:** The WHO mortality database was queried for mortality rates of anencephaly in the six Central and South American countries of Argentina, Brazil, Chile, Mexico, Paraguay, and Peru.

**Results:** There was a total of 21,448 deaths due to anencephaly across the study period. All countries saw a decrease in the total number of deaths from 2000 to 2020. Brazil had the most deaths at 11,280, followed by Mexico (5,253 deaths), Argentina (2,583), Chile (1,068), Peru (752), and Paraguay (512; Figure 1). In 2019, Paraguay had the highest number of anencephaly specific deaths out of total deaths in the country at 0.07, with Mexico having the lowest at 0.01. Chile had the largest decrease in death rate per 100,00 people from 0.50 in 2000 to 0.13 in 2018 (-72.3%), followed by Mexico (0.37 in 2000 to 0.14 in 2019 [-63.0%]). Paraguay had an increase from 0.30 in 2000 to 0.31 in 2019 (+3.9%; Figure 2).

**Conclusions:** Progress has been made to decrease anencephaly rates in Central and America. These results warrant future investigation into the health and safety measures that have led to these improvements.

## Education, Ethics, Socioeconomic

ePoster presentation

### Critical appraisal of neurosurgical fellowship program websites: functional and stereotactic neurosurgery

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**Objectives:** No critical analysis of functional neurosurgery program websites (FNW) has yet been published. The objective of our study was three-fold:

- 1) appraise available accessible information of available functional neurosurgical fellowship databases;
- 2) evaluate extent of education and recruitment information available on each FNW; and
- 3) assess associations between website comprehensiveness and program characteristics.

**Background:** Increasingly, applicants to various residencies and fellowships have utilized program websites for information. This trend has increased during the COVID-19 health crisis.

**Methods:**

Two lists of functional neurosurgical fellowship programs are maintained by the American Society for Stereotactic and Functional Neurosurgery (ASSFN) and the American Association of Neurological Surgeons (AANS). Programs were excluded if they were not actively recruiting for a position in the 2021–2022. Although not a cross-sectional study, this study adheres to the guidelines for the Strengthening and Reporting of Observational Studies in Epidemiology as closely as possible. All available information was collected solely from program databases and websites.

**Results:** The AASFN website listed 43 functional neurosurgical programs, and the AANS website included 38 functional neurosurgical programs. Of the 35 programs, the AASFN database provided website links for 32 (81.4%) of programs, with email contacts in 27 (77.1%) and phone number contacts in 31 (88.6%). Thirteen different features were evaluated within the recruitment aspect of individual FNWs. Of the 35 FNWs, programs displayed an average of 3.66 (28.1%) of the 13 available features. The most frequently listed features in this category were program contact email (82.9%), program description (74.3%), recruitment elevation/selection criteria (51.4%), wellbeing/social information (34.3%), and city information (28.6%) in descending order. Work hours and meal allowance were seldom included (2.9%), and debt management information was not included on any program websites.

**Conclusions:** Although many functional neurosurgery programs have maintained comprehensive FNWs, there are clear deficiencies in important aspects of available recruitment and education content.

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## Epilepsy

Oral presentation

### Endoscopic, ablation, and radiosurgical approaches to hypothalamic hamartomas: a systematic review and patient-level meta-analysis

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**Objectives:** This patient-level meta-analysis aims to compare seizure freedom rates for HHs treated via endoscopic disconnection and/or resection, ablation, and radiosurgery.

**Background:** Hypothalamic hamartomas are benign lesions that most often present with refractory epilepsy and gelastic seizures. Numerous minimally invasive treatments for HHs have been developed though their efficacy in treating seizures has not been closely analyzed.

**Methods:** A systematic review was performed utilizing three databases.

**Results:** 67 studies which reported individual patient data were included for analysis encompassing a total of 229 patients (75/219 females). Most common presenting seizures included gelastic seizures in 183 patients (79.9%). A total of 36 patients (16.7%) had precocious puberty, and 100 patients (46.5%) had neurocognitive deficits. A total of 82 (33 females, 40%) patients were treated via endoscopic disconnection. 39 patients (48%) were Engel Class (EC) I, 23 patients (28%) were EC II, 15 patients (18%) were EC III, and 4 patients (4.9%) were EC IV. Furthermore, a total of 31 (8 females, 26%) patients were treated via endoscopic resection. 14 patients (45%) were Engel Class (EC) I, 8 patients (26%) were EC II, 0 patients (0%) were EC III, and 9 patients (29%) were EC IV. Next, a total of 83 (24 females, 32%) patients were treated via either LiTT or thermal ablation. 57 patients (69%) were Engel Class (EC) I, 12 patients (14%) were EC II, 4 patients (4.8%) were EC III, and 10 patients (12%) were EC IV. Last, a total of 33 (10, 32%) patients were treated via radiotherapy. 18 patients (55%) were Engel Class (EC) I, 9 patients (27%) were EC II, 3 patients (9.1%) were EC III, and 3 patients (9.1%) were EC IV.

**Conclusions:** Though the preliminary results associated with these approaches are promising, studies with larger sample sizes and longer follow-up durations must be conducted before definitive conclusions are made.

## Oncology

ePoster presentation

### Treatment at an academic center is associated with improved overall survival amongst meningioma patients

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**Objectives:** Herein, we investigate the relationship between facility type and surgical outcomes in meningioma patients.

**Background:** There is a growing body of evidence demonstrating improved outcomes for patients with CNS neoplasms treated at academic centers (ACs) versus non-academic centers (non-ACs). This represents a potential healthcare disparity within neurosurgery.

**Methods:** The National Cancer Database was queried for adult patients diagnosed with intracranial meningioma requiring intervention between 2004 and 2019. Patients were stratified by facility type and the Mann-Whitney U and Fisher exact tests were used for bivariate analysis of continuous and categorical variables. Multivariable logistic and linear regression were used to assess whether demographic variables predicted treatment at non-ACs. Furthermore, multivariate cox proportion hazard and log-rank tests were used to determine whether facility type was related to overall survival (OS).

**Results:** In total, 139,304 patients (73.7% male, 84.23% white) diagnosed with meningioma were included and stratified by facility type: 50,349 (36.2%) patients were treated at an AC and 88,955 patients (63.8%) were treated at a non-AC. Patients treated at an AC were more likely to be Black, Asian, carry Medicaid, or be uninsured ( $p < 0.001$ ), have an income  $< \$30,000$  or  $> \$46,000$  ( $p < 0.001$ ) and have larger tumors on average (33.57 mm vs 36.91 mm,  $p < 0.001$ ). Furthermore, AC patients were more likely to be offered surgical intervention (34% vs. 47%,  $p < 0.001$ ) and more likely to have tumors exhibiting 'borderline' or 'invasive' behavior ( $p < 0.001$ ). Patients treated at ACs demonstrated higher median OS (in months), 2-year, 5-year, and 10-year survivals than patients treated at non-ACs. On Cox multivariate proportion analysis, treatment at AC was associated with improved survival (HR 0.900, (CI: 0.882-0.918),  $p < 0.001$ ).

**Conclusions:** Our results indicate that facility type is associated with disparate survival outcomes in treatment of intracranial meningiomas. Namely, patients treated at non-ACs appear to suffer a survival disadvantage as demonstrated by both bivariate and multivariate analyses.

## Oncology

ePoster presentation

### An online calculator using machine learning for prediction of survival in pediatric patients with medulloblastoma

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**Objectives:** The authors aimed to identify risk factors and develop a clinically friendly online calculator for prognostic estimation in pediatric medulloblastoma patients.

**Background:** Medulloblastoma is the most common malignant intracranial tumor affecting the pediatric population. Despite advancements in multimodal treatment over the past 2 decades yielding a >75% 5- year survival rate, children who survive often have substantial neurological and cognitive sequelae.

**Methods:** Pediatric patients with a histopathologically confirmed medulloblastoma were extracted from the Surveillance Epidemiology and End Results database (2000-2019) and split into training and validation cohorts in an 80:20 ratio. The Cox proportional hazards model was used to identify the univariate and multivariate survival predictors. Subsequently, a calculator with those factors was developed to predict 2-, 5-, and 10-year overall survival as well as median survival months for pediatric medulloblastoma patients. The performance of the calculator was determined by discrimination, calibration, and decision curve analysis (DCA).

**Results:** A total of 1,739 pediatric patients with medulloblastoma met the prespecified inclusion criteria. Fourteen variables, including age, sex, race, ethnicity, median household income, county attribute, laterality, histology, anatomical location, tumor grade, tumor size, surgery status, radiotherapy, and chemotherapy, were included in the calculator ([https://spine.shinyapps.io/Peds\\_medullo/](https://spine.shinyapps.io/Peds_medullo/)). The concordance index was 0.757 in the training cohort and 0.762 in the validation cohort, denoting clinically useful predictive accuracy. Good agreement between the predicted and observed outcomes was demonstrated by the calibration plots. The DCA curves indicated that the developed model has a good clinical prognostic benefit for pediatric medulloblastoma patients.

**Conclusions:** An easy-to-use prognostic calculator for a large cohort of pediatric patients was established. Future efforts should focus on improving granularity of population-based registries and externally validating the proposed calculator.



## Trauma

Oral presentation

The 5-Factor modified Frailty Index (mFI-5) predicts return to operating room for patients with traumatic spinal injury undergoing posterior fusion

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**Objectives:** In this study, the authors quantified the influence of the 5-factor modified frailty index (mFI-5) score on [hospital](#) length of stay, diagnosis of a [postoperative infection](#), 30-day readmission, and 90-day return to operating room (OR).

**Background:** Within the trauma spine surgery literature, the effect of [patient frailty](#) on postoperative outcomes for posterior [spinal fusion](#) (PSF) remains clear.

**Methods:** The authors retrospectively reviewed the records of all patients with traumatic spine injury undergoing PSF by a single surgeon at our institution from 2016 to 2021. Data were extracted using manual chart review and the mFI-5 score was calculated using data on [comorbidities](#). Bivariate (Mann-Whitney *U* test and Fisher exact test) and multivariate regressions (linear and logistic) revealed whether there was an independent relationship between patient frailty and postoperative outcomes.

**Results:** The patient cohort included 263 patients (52.00 ± 19.04), 67 (25.5) were classified as frail, defined as having an mFI-5 score ≥2. Patients who were classified as frail were significantly more likely to have diabetes (odds ratio = 21.53; *P* < 0.001) and active cancer (odds ratio = 10.03; *P* = 0.004). Patients with mFI-5 scores ≥2 were also significantly older (*P* < 0.001) and had higher [body mass index](#) (BMI) (*P* = 0.007).

Patients with mFI-5 scores >2 were more likely to return to the OR (odds ratio = 2.43; *P* = 0.037) on [bivariate analysis](#). When controlling for demographics and clinical characteristics, mFI-5 score independently predicted return to OR (odds ratio = 1.294; *P* = 0.041).

**Conclusions:** Patient frailty independently predicted a return to OR [in patients](#) undergoing PSF for traumatic spine injury. Future studies can investigate methods for patient risk optimization to reduce morbidity and mortality.

1187

## Skull Base

Oral presentation

Advanced intraoperative monitoring for posterior skull base neurosurgery

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**Objectives:** To enhance surgical safety with novel intraoperative monitoring techniques in posterior skull base neurosurgery

**Background:** Besides basic SSEP, MEP, BAEP and lower cranial nerves monitoring, there are recent reports of direct brainstem stimulation for corticospinal tract motor response and SSEP response via scalp recordings. There is no report on continuous intraoperative neuromonitoring (CIONM) of the cornea reflex that helps to protect cornea and vision.

**Methods:** A prospective study of 20 consecutive patients with lesions in proximity to the brainstem was performed between Jan 2021 and Jun 2023. Blink reflex (BR), the electronic analogue of the cornea reflex, was elicited by electrical stimulation of the supraorbital nerves. Recording electrodes for R1 response were placed over orbicularis oculi muscle at lower eyelid. Preoperative tumour volume and maximal midline shift (MLS) of brainstem were measured, using readily identifiable anatomical landmarks, namely cerebral aqueduct, median sulcus of 4th ventricle, and mid-point of interpeduncular fossa. Patients' intraoperative findings and postoperative clinical outcomes were correlated and reported.

**Results:** There were 12 female and 8 male patients, with the age ranging from 41 to 81 (mean 62.5). Six underwent microvascular decompression and 14 excision of tumours of size ranging from 1.1 to 81.6 cm<sup>3</sup> (mean 24.2 cm<sup>3</sup>). One-Sample Binomial Test showed statistically significant difference in tumour volume ( $p=0.041$ ; 42.0 vs 14.4 cm<sup>3</sup>) and maximal MLS of brainstem ( $p=0.041$ ; 7.5 vs 3.9mm) regarding positive BR response and presence of postoperative neurological deficits. The sensitivity, specificity, positive and negative predictive values of BR response in detection of postoperative neurological deficits were 100%, 93.8%, 80% and 100% respectively, with 95% CI 39.8-100%, 69.8-99.8%, 28.4-99.5% and 78.2-100% respectively.

**Conclusions:** CIONM of BR is feasible, safe and useful in preservation of cornea sensation, especially for patients with large posterior fossa tumours and distorted brainstem.

1188

## Functional

ePoster presentation

### Success of stereotactic ablative surgery for involuntary movements after treatment of germinoma in the pineal area

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**Objectives:** We experienced two cases of involuntary movements associated with germinoma located pineal area.

**Background:** Involuntary movements associated with germinoma and their causes were unknown as far as we could determine.

**Methods:** First case was of a 14-year-old male with shaking of the left hand since the age of 13 who was diagnosed with pineal tumor through comprehensive examination. Combined chemotherapy and radiation therapy were administered. As a result, the patient's course was good, except for gradual worsening of his left-hand tremors. Deep brain stimulation was ruled out from the treatment plan due to the need for regular MRI follow-up, and he was referred to our department for stereotactic thalamotomy. Right Vim thalamotomy was performed, which effectively improved the symptom without any complications. The second case was of a 29-year-old male diagnosed with pineal tumor at the age of 13 after reporting impairment of vision. Tumor removal via craniotomy was performed 1 year later; based on the diagnosis of germinoma through histopathology of the mass, adjuvant radiation therapy was administered. The patient was referred to our department after experiencing involuntary movements mainly in the neck, trunk, and both arms since the age of 23. Stereotactic ablation was performed in two stages in the following order: left pallidotomy followed by right pallidothalamic tractotomy; as a result, his involuntary movements were cured without any obvious complications.

**Results:** Stereotactic ablative surgery was performed with good results.

**Conclusions:** Stereotactic ablative surgery is useful for the patient who need frequent MRI scans for follow up primary disease. In all cases, tumor location at the region of the pineal gland complicated the target plan, especially that of the Vim nucleus, due to deficits or significant deformations at the posterior commissure. In that cases, anatomical digital record structures helps target planning.

1192

## Skull Base

Oral presentation

Outcome and recurrence rate in vestibular schwannoma surgery without internal auditory canal drilling

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**Objectives:** The standard procedure of vestibular schwannoma surgery involves IAC drilling to remove the intracanalicular part. This paper describes the factors affecting outcome and recurrence in VS surgery without IAC drilling.

**Background:** Drilling of IAC is associated with additional complications like paradoxical csf rhinorrhoea, semicircular canal damage .endolymphatic. sac and jugular bulb injury,Hence the recurrence is analysed to see the outcome without drilling IAC.

**Methods:** Retrospective data of 428 consecutive patients who underwent surgical excision for sporadic vestibular schwannoma with and without IAC drilling between January 2010 and August 2022 were collected. Intracanalicular portion was removed using endoscope and ring curette, preserving the facial nerve. IAC drilling was done for cases operated before 2018. Cases operated after 2018 , drilling was avoided and iac part was removed with endoscope.

**Results:** The recurrence rate was analysed with the following variable like IAC DRILLING, RESIDUAL TUMOR AND MIB index . The only significant factor for recurrence was MIB index. The recurrence in the group of patients with IAC drilling (248) was 8.4 as compared to the group of patients without IAC drilling of 8-5%. The incidence of paradoxical CSF leak was 3/248 versus 0/170 cases.

**Conclusions:** There is no difference in the recurrence rates of vestibular schwannoma regardless of whether IAC drilling was done during surgery or not. MIB-1 index can be used as a predictor for recurrence in vestibular schwannomas. Complications associated with IAC drilling could be avoided by endoscopic removal of tumor in IAC.

1193

## Oncology

ePoster presentation

Behaviour of invitro glioma cell culture in different grades of tumour and correlation with histopathological and clinical outcomes

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**Objectives:** To compare proliferative index in glioma cell cultures and its implication in survival of different grades of glioma patients, and To study novel markers in glioma.

**Background:** The biological behavior does not always correlate with histology and immunohistochemistry, Here we study the proliferative index in glioma cell culture and correlate with biological behavior.

**Methods:** Glioma tissues from 84 patients were collected after Ethics approval and cultured as primary cells in DMEM/F12 medium supplemented with Fetal bovine, EGF and FGF. Based on the Population doubling time, cultured cells were categorized as high proliferation rate (having PDT < 72h) , low proliferation rate (having PDT > 72h). . All the cultured cells were analyzed for the presence of GFAP, vimentin, N-cadherin, TWIST and cMyc. Cell viability was measured after 48 hrs treatment with the indicated concentration of temozolamide.

**Results:** Different pattern of proliferation irrespective of their grade and IDH status was observed in cells. Progression free survival and over all survival period compared in each group according to proliferation index. In low proliferative cultures overall survival period and Progression free survival period is high when compared to high proliferative index cultures. Low proliferating cultures of grade II, III and IV tend to be more sensitive to TMZ when compared with high proliferating cultures. HPI correlating with strong expression of GMT markers as compare to LPI group. Also we are comparing the predictive value of proliferative index versus P53 and mib index.

**Conclusions:** 1. There is progression free and overall survival difference according to proliferative index in grade 2 , grade 3 and grade 4

2. Low proliferating cultures of grade II,III and IV Glioma tend to be more sensitive to TMZ when compared with high proliferating cultures

3. HPI correlating with strong expression of GMT markers as compare to LPI group.

1194

## Spine

ePoster presentation

### Type 1 neurofibromatosis revealed by spinal cord compression

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**Objectives:** To describe clinical and imaging findings of a cervical spinal cord compression caused by neurofibromatosis and its surgical management.

**Background:** Type 1 neurofibromatosis is a neurocutaneous condition with an autosomal dominant pattern of inheritance. This congenital disease is characterized by a wide spectrum of clinical manifestations and degree of severity.

**Methods:** We report the case of a patient who was treated in our department for a cervical spinal cord compression caused by neurofibromatosis.

**Results:** An 18-year-old boy consulted the emergency department for walking disturbances developing for 7 days. The patient had tetra paresis which was predominant in the lower limbs. An Upper motor neuron syndrome was objected. There was no sensitive deficit. Cranial nerves were intact. The patient had multiple café au lait stains. Multiples nodes were palpable in the 4 limbs and in the thorax. Ophthalmic examination was normal. There were no similar cases within the family members. A type 1 neurofibromatosis was diagnosed. The patient had an urgent spinal MRI which revealed an abnormality of all the spinal nerves with cervical spinal compression. The patient underwent an urgent postero-lateral decompression of the cervical spine. The motor deficit improved after the surgery. Pathological examination was in favor of neurofibromatosis.

**Conclusions:** Type 1 neurofibromatosis is a common cancer predisposition syndrome. Affected individuals require lifelong surveillance and often suffer progressive disfigurement due to cutaneous neurofibromas.

1195

## Trauma

Oral presentation

### Metagenomic sequencing of the skin microbiota of the scalp predicting the risk of developing surgical site infections following TBI surgery

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**Objectives:** To elucidate the relationship between the genotypic taxonomy and abundance of the scalp skin microbiota and the occurrence of surgical site infection following TBI surgery.

**Background:** The occurrence of surgical site infections (SSI) is one of the post-operative challenges of the surgical management of traumatic brain injury (TBI) in sub-Saharan Africa. These infections originate usually from the surrounding residual bacteria of the skin of the head where the incision is made during surgery. Through the breached skin, bacteria are dragged deep into the layers of the skin, eventually may go deeper up to the cranial cavity, causing a potentially deadly infection. The skin microbiota acting physical barrier may dually become a protecting versus a predisposing factor for the occurrence of SSI.

**Methods:** Patients with the diagnosis of closed depressed skull fracture and scheduled for emergency TBI surgery were recruited. A swab of the skin surrounding the scalp was collected before the surgical site preparation. A sterile skin swab of the surrounding normal skin of the head was taken using a sterile cotton swab, then stored at -80 degrees. Patients were followed up postoperatively until discharge for the possible occurrence of SSI. A 16S rRNA sequencing from swabs of the skin microbiota was done, initially encoded in fastq. Bio-informatics software revealed the identification of the sequences of different taxonomic microorganisms at the level of genera and species. Analysis was done between the 2 groups (SSI=infected and non-infected).

**Results:** A total of 108 TBI patients enrolled with a mean age of 23.6 years and the majority 100/108 (92.6%) were males, and 16 (14.8%) of them developed SSI with microbiological evidence. Skin microbiome was associated with the incidence of SSI.

**Conclusions:** There is an association between taxonomy, skin microbiome abundance of the scalp, and the occurrence of SSI following TBI surgery. We hypothesize under reserve that genotypic patterns of the scalp skin may be an independent factor in the incidence of SSI.

1196

## Functional

ePoster presentation

### Magnetic resonance-guided focused ultrasound thalamotomy for focal hand dystonia: a pilot study

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**Objectives:** We aimed to prospectively investigate the efficacy of MRgFUS thalamotomy for the treatment of FHD.

**Background:** The efficacy of magnetic resonance-guided focused ultrasound (MRgFUS) thalamotomy for the treatment of focal hand dystonia (FHD) is not well known.

**Methods:** We performed MRgFUS thalamotomy of the ventro-oral (Vo) nucleus in 10 patients with FHD. We evaluated the scores of the Writer's Cramp Rating Scale (WCRS, 0–30; higher scores indicating greater severity), Tubiana Musician's Dystonia Scale (TMDS, 0–5; lower scores indicating greater severity), and Arm Dystonia Disability Scale (ADDS, 0%–100%; lower scores indicating greater disability) at baseline and 3 and 12 months post-treatment.

**Results:** WCRS, TMDS, and ADDS scores significantly improved from  $6.3 \pm 2.7$ ,  $1.4 \pm 0.5$ , and  $58.7\% \pm 14.3\%$  at baseline to  $1.6 \pm 3.1$  ( $P = 0.011$ ),  $5.0 \pm 0$  ( $P = 0.0001$ ), and  $81.6\% \pm 22.9\%$  ( $P = 0.0229$ ) at 12 months, respectively. There was one prolonged case of dysarthria at 12 months.

**Conclusions:** We show that MRgFUS Vo-thalamotomy significantly improved FHD.



1197

## Oncology

ePoster presentation

CNS Masson tumor

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**Objectives:** Intravascular papillary endothelial hyperplasia (Masson's vegetated hemangioendothelioma) is a rare condition affecting the neuroaxis. One symptomatic spinal and 4 intracranial Masson's tumors are presented.

**Background:** Masson tumor (MT, papillary endothelial hyperplasia) is an exaggerated form of thrombus reorganization rarely occurring in the central nervous system (CNS), where it presents as a mass or hemorrhage in parenchyma, meninges, or venous sinuses. MT is subclassified as type 1 arising within a histologically normal vessel, type 2 associated with a ruptured vascular malformation, and extravascular.

**Methods:** The cases of Masson's tumor in the central nervous system (intracranial and spinal) were presented with their clinical, radiological and histopathological diagnosis and treatments.

**Results:** Four rare cases of intracranial intravascular papillary endothelial hyperplasia (IPEH) manifesting as cranial nerve disturbances occurred in 16-, 18-, 24-, and 28-year-old females. Magnetic resonance imaging showed all lesions as isointense with strong enhancement on T1-weighted images, and as hyperintense on T2-weighted images. All lesions were removed via craniotomies. Histological examination found vascular structures and papillary spaces lined with endothelial cells showing immunoreactivity for CD31. Complete removal was curative in two cases, whereas incomplete removal resulted in cure in one case and residual deficits in one case. Iatrogenic deficits should be avoided in IPEH treatment by surgery. Differentiation from neoplasm such as angiosarcoma depends on histological characteristics.

In the literature, only eight cases of this lesion involving the vertebral canal with spinal cord compression has been reported. We present a 37-year-old man with thoracic location mimicking schwannoma.

**Conclusions:** Differential diagnosis, management, importance as a neurosurgeon and, review of literature are discussed in this short presentation.

1200

## Spine

ePoster presentation

Using of mesh titanium grid in the treatment of hydatid cysts damage vertebrae

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**Objectives:** Aim: Improving of surgical treatment of fracture of vertebrae body by hydatid cysts by fusion with MASH implant.

**Background:** In humans, hydatid disease of the spine is a rare form of parasitic infection, causing focal neurological signs, commonly observed in sheep-raising areas of the world, and it affects the vertebral column in 0.2–1% of all patients of which spine is involved in approximately 45% of cases even in rural areas where echinococcosis is endemic and dead end of parasite of hydatid.

**Methods:** The complaints when came to the pains in the field of top-lumbar department of a backbone amplifying at the movement (the body is bent in front - forced antalgic pose), delicacy, a numbness in the forward surface of hips, more on the right, periodic difficulty at the act of urination and difficulty at independent walking. Earlier had no tuberculosis, tubercular contact isn't known. In process of increase of the above-stated complaints was recommended MRI investigation of lumbar level of a backbone where is noted the set of a cyst of the striking VL1 body with pathological fracture. The condition when entering was estimated as of moderate severity for the expressed pain syndrome.

**Results:** For verification of the diagnosis the patient was made an operation: "A lumbotomy at the left, a subtotal corporectomy of a body of L1 with excision existant extravertebral and epidural located cysts and forward decompression of a spinal cord with the subsequent spondilodesis with a titanium implant between VTh12-VL1 and a drainage of a wound cavity". Numerous large and petty capsules with liquid contents and osteal sequesters are removed. Histological research: the hydatid cyst.

**Conclusions:** Thus, the presented case of an hydatid lesion of a backbone is interesting because of a rarity of a disease and allows mistakes, at stages of diagnostics and treatment.

1201

## Spine

ePoster presentation

Lower cervical spine treatment at Parakou University Teaching Hospital from 2012 to 2019 in Benin Republic

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**Objectives:** Report our management of spinal cord injury and spine injury due to trauma in the lower cervical spine.

**Background:** Cervical spine injuries include disco-ligamentous and / or bone lesions of the cervical spine with or without neurological disorders that occur as a result of a wounding action. Emergency taking care of this patients is correlated to the vital and functional prognosis.

**Methods:** This was a cross-sectional, descriptive, analytical study.

**Results:** The frequency of lower cervical level injury is 50.2% of traumatic spine disorders. The average age of the patients was  $33.91 \pm 14.51$  years and a sex ratio of 11.33. The etiologies are dominated by road traffic accident (52.25%). The lesions were ranged on grade A (38.74%) according to Franckel Scale. Limiting helped to identify serious sprains in 25.49% of cases. Lesions predominated at C5-C6 levels (33.33%). The surgery was performed in 20 patients. Recovery was effective in 39 patients (41.1%) and death was observed in 16.22% of cases.

**Conclusions:** Spinal cord injury of the lower cervical spine is serious and a real public health problem. Prevention remains the best treatment.

1202

## Spine

ePoster presentation

The use of an improved cylindrical cage for hernias of the cervical spine

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**Objectives:** Improve the results of surgical treatment of patients with herniated discs of the cervical spine using an improved cylindrical cage from the anterior parafarengeal access on the left.

**Background:** The most common cause of pain in the neck, shoulder and upper extremities is a herniated disc of the cervical spine. Symptoms may include dull or sharp pain in the neck or between the shoulder blades, pain radiating into the arm, numbness and tingling in the shoulders or arms.

**Methods:** The results of treatment of 22 patients (16 women, 6 men) aged 18 to 66 years (mean age 34.6 years) with compression of the spinal cord and/or its roots with soft and/or hard (osteophytes) disc hernias, which were found to be 26 (in 22 patients, single-level disc herniation and the other 4 patients have two-level) advanced cylindrical titanium cages. To verify the affected vertebral-motor segment, standard spondylography was performed, supplemented with functional tests in 9 patients; magnetic resonance imaging (MRI) — in all 22 patients; multispinal computed tomography (MSCT) — in 12; electroneuromyography (ENMG) of the upper extremities — in 18 patients.

**Results:** All patients were operated under endotracheal anesthesia from the left-sided parapharyngeal Clovard access. Rectangular excision of the anterior part of the fibrous ring with a scalpel was performed with the removal of the degenerated disc using curettes and pliers to the closure plates and microsurgical decompression of the dural sac and roots by removing a herniated disc or resection of posterior osteophytes from the central and lateral channels. The second stage was to determine the height of the cage.

**Conclusions:** Surgical treatment with implantation of advanced cylindrical titanium cages in patients with discoradicular and discomedullary conflict at the cervical level allowed to obtain good clinical and functional results in the near and long-term periods.

1203

## Paediatric

ePoster presentation

### Minimally invasive tubular retractor in pediatric neurosurgery

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**Objectives:** There are many approaches for the resection of intracranial lesions in children. The purpose of this talk is to explain the benefits of tubular retraction in variety of pediatric neurosurgery cases.

**Background:** Pediatric brain tumors, vascular and congenital lesions of the brain are common. There are many surgical approaches to these lesions but the authors highlight their experience using a tubular retraction system (Vicar and BrainPath) to safely resect the lesions.

**Methods:** Using tubular retractors the authors describe their experience resecting neoplasms, cavernous malformations and congenital lesions in the supratentorial and intratentorial compartment. The authors share their technique and selection of the retraction system in these cases.

**Results:** Using this minimally invasive technique the authors describe their experience with 50 children. The technique was 100% effective in reaching the lesion and achieving the goal of surgery. Complications were observed in 4% with no CSF leak, infection or hemorrhage along the tract. The morbidity was 0%. The variety of lesions included low and high grade gliomas, meningioma, craniopharyngiomas, colloid cysts, and cavernous malformations.

**Conclusions:** Tubular retractors are a good alternative to the standard approach for brain tumors and vascular lesions in children. They offer a minimally invasive approach to resecting deep situated lesions.

1204

## Oncology

Oral presentation

Impact of metabolic syndrome on postoperative outcomes of transsphenoidal pituitary surgery

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**Objectives:** This study aimed to evaluate the influence of metabolic syndrome (MetS) on the surgical outcome in patients with pituitary adenoma who received transsphenoidal surgery (TSS).

**Background:** Pituitary tumor is a common neuroendocrine tumor which can be removed by transsphenoidal surgery when indicated. However, post-operative morbidities although not common, can lead to serious consequences. Metabolic syndrome is a common disease nowadays and had been reported as a significant risk for post-operative outcomes in various surgical procedures such as cardiac surgery and general surgery. However, limited data had reported the impact of MetS on pituitary surgery.

**Methods:** This population-based, retrospective observational study extracted data of adults aged 20-79 years receiving TSS for pituitary adenoma from the US Nationwide Inpatient Sample (NIS) database between 2005-2018. All data were analyzed retrospectively, including demographic and clinical characteristics, primary and secondary diagnoses, primary and secondary procedures, admission/discharge status and hospital characteristics. Diagnoses were confirmed using codes of the International Classification of Diseases, Ninth & Tenth Revisions (ICD-9, ICD-10).

**Results:** Pre-existing MetS was not associated with the risk of adverse postoperative outcomes, including in-hospital death or discharge to long-term care facilities, but did independently predict longer hospital stays and higher hospital costs. MetS was also independently associated with a 22% increased risk of cerebrospinal fluid (CSF) rhinorrhea and a 17% reduced risk of diabetes insipidus. Patients with MetS were more likely to have patient safety indicators (PSI) than those without MetS.

**Conclusions:** MetS does not pose an excessive risk of poor major postoperative outcomes but predicts short-term surgical-related complications in patients receiving TSS for pituitary adenoma. Study findings may help clinicians achieve better risk stratification before TSS.

1206

## Neurovascular Surgery

Oral presentation

Endoscopic hematoma evacuation can be beneficial in high grade spontaneous intracerebral hemorrhage

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**Objectives:** This study aimed to compare microscopic and endoscopic surgery for spontaneous intracerebral hemorrhage.

**Background:** Spontaneous intracerebral haemorrhage (ICH) sometimes required surgical treatment when hematoma causes salvageable and symptomatic mass effects. Surgical procedure varies from craniectomy, to craniotomy with or without microscopic surgery, stereotactic aspiration with or without thrombolytic agents, and minimal invasive (MIS) endoscopic surgery. Although there is a trend toward a less invasive approach for ICH surgery, the surgical choice between a craniotomy and MIS is still under debate.

**Methods:** We retrospectively reviewed patients with spontaneous ICH undergoing surgical procedures in our institution from 2018-2022. Clinical characteristics, including ICH score, location, overall mortality and 30-days modified Rankin scale were compared between the endoscopic surgery group and non-endoscopic surgery group.

**Results:** Three hundred and ten patients were admitted to our department with spontaneous ICH. Among them, 74 patients received hematoma evacuation. Thirty-four patients received endoscopic hematoma evacuation whilst 40 patients received non-endoscopic surgery. ICH locations in the endoscopic groups were 13 in putamen, 13 in thalamus, 2 in caudate, 1 in cerebellum, 3 in cerebral lobe, and 2 in ventricle. The initial ICH score was 1.53 in non-endoscope group versus 2.45 in endoscopic group ( $p = 0.0075$ ). The initial coma scale was significantly lower in the endoscopic group ( $p = 0.0057$ ).

Overall mortality was similar between two groups (20.6% versus 17.5%,  $p = 0.7353$ ). There was no significant difference in 30 days good outcome (mRS  $\leq 3$ , 26.5% versus 42.5%,  $p = 0.3488$ ).

**Conclusions:** Our study showed that the overall outcome was similar between endoscopic and microscopic surgery. However, there was significantly worse initial ICH score in the endoscopic surgical patients. Therefore, endoscopic surgery can potentially be beneficial to those with severe ICH patients.

1207

## Neurovascular Surgery

ePoster presentation

Esoterica of MU surgery

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**Objectives:** To maintain to keep surgical technique.

**Background:** Nowadays intracranial aneurysms are mainly treated by endovascular method, However, bifurcation type fusiform shape and giant aneurysms are difficult to treat by IVR.

**Methods:** After 5.000aneurysms clipping surgery, I have got Acom an surgical technique, tentative clipping method, way of multi clipping, dome coagulation, clipping on wrapping method, original artery reconstruction, and sometime flow alternation by clipping with or without bypass.

**Results:** For small bifurcation aneurysms, original artery reconstruction is the best pattern for clipping, however for large or giant aneurysms at the bifurcation, if you clip the an, to make the original artery which is easy to regrow denovo an. Therefor we change the flow from bifurcation type to side wall type with or without bypass. IVR is inside approach to the artery but surgery is outside approach of the vessel. Therefore we can coagulate the an to make easy shape to clip. When there are weak point , we can wrap and enforce them.

**Conclusions:** These technical details will be shown by video after my 5000 aneurysm surgical experiences.



1208

## Hydrocephalus

Oral presentation

An in-country humanitarian neurosurgical services as model for low-and-middle-income countries: the case of Cote d' Ivoire

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**Objectives:** The goal of this work was to describe the humanitarian activities within the country that target neurosurgical patients.

**Background:** Humanitarian neurosurgery in Sahara Africa exists for over 05 decades. Yet, the body of literature in this topic is scarce. In Cote d'Ivoire, humanitarian missions are organized by local entities since 2019 to raise awareness and provide free neurosurgical care to vulnerable patients.

**Methods:** The authors conducted a retrospective data analysis of children operated during humanitarian missions and described of the coordinating organization.

**Results:** Humanitarian neurosurgery in Cote d'Ivoire involved 02 NGOs and 02 hospitals and volunteering neurosurgeons. Four educational campaigns with free patient screening examined 213 infants and operated 109 for hydrocephalus and myelomeningocele.

**Conclusions:** Humanitarian missions in Ivory Coast is at a sprouting stage and is limited to the treatment of congenital malformations. Strategies for local fundraising using social media have helped sustain the activities.

1209

## Trauma

ePoster presentation

### Penetrating brain injury by foreign body with diagnosis and treatment strategy - a 20-year systematic review

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**Objectives:** We reviewed the reported cases in the past 20 years, combined with a case in our hospital, analyzed their diagnosis and treatment process, summarized the characteristics of this disease, and explored standardized management strategies.

**Background:** Penetrating brain injury is a subset of craniocerebral injury with high mortality and morbidity. Yet ideal management strategies are lacking.

**Methods:** We performed a systematic review complying with PRISMA rules. Review was registered in PROSPERO. Multiple databases were searched for case reports or case series from 2003 to 2023. The data extracted from the literature included author, date, entrance of injury, mechanism, antibiotic prophylaxis, imaging manifestation, phenotype of foreign body, outcome and so on.

**Results:** With screening and exclusion, we eventually included 77 studies, which included 106 cases, with 1 special case in our hospital, among which 83 cases (78.3%) underwent open surgery, and 23 cases (21.7%) underwent direct extraction. Twenty-three cases (21.7%) ignored vascular evaluation during diagnosis, while 19 cases (17.9%) presented misdiagnosis and missed diagnosis preoperatively. Among them, 4 missed diagnosis cases were wooden. Overall, 85 cases (80.2%) had a good prognosis, 74 cases (88.1%) had a good prognosis after open surgery and 11 cases (68.7%) after direct extraction, ( $P=0.032$ ), proportion of postoperative infection was mainly wooden foreign bodies, accounting for 55.6% of all foreign bodies.

**Conclusions:** Blood vessels are abundant in brain tissue, and foreign bodies can easily damage cerebral vasculature through the skull. Therefore, vascular evaluation is a key point in the diagnosis and treatment of this disease. Based on the research, we found that it was necessary but difficult to assess whether there was vascular injury, and open surgery is safer and more effective as long as there are adjacent vessels. In addition, antibiotic use is very important to prevent posttraumatic infection.

1210

## Oncology

ePoster presentation

Establishing a surgical treatment protocol for eloquent area gliomas: optimizing resources in low-to-middle income countries

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**Objectives:** We aim to describe an algorithm to decide the tumor surgical approach strategy according to the glioma location and functional features at risk.

**Background:** The definition of an eloquent area may vary in the literature. However, the strategy for the surgical attack may vary according to the potential neural function at risk. Technology was been more available in low-to-middle-income countries (LMICs). However, public and private healthcare resources should be optimized without compromising the patient's neurological function.

**Methods:** We designed a cost-saving strategy according to diffuse gliomas' anatomical and functional features. All patients operated on from 2015-2022 in our institution were included. Costs of equipment renting and clinical features were collected.

**Results:** We have included 121 diffuse glioma patients treated with this protocol. We propose 4 tumor groups: 1) related to language areas, 2) related to motor areas, 3) related to visual areas, and 4) non-related to language, motor, or visual areas. Brain mapping should be focused by groups as follows: 1) awake craniotomy with direct stimulation+neuronavigation+tractography, 2) asleep craniotomy with direct stimulation+neuronavigation+tractography, 3) neuronavigation+tractography, and 4) neuronavigation only. Our country's average cost of renting the equipment is approximately 1000-1200 USD for the neuronavigation system (additional 450 USD for tractography processing and intraoperative fusion), and 1200-1500 USD for electrophysiological monitoring. This protocol guided the optimized use of the required technology for each procedure, which is now available given the option to rent the necessary equipment for comprehensive intraoperative brain mapping. This translates into better rates of preservation of neurological function without increasing procedure-related costs.

**Conclusions:** We propose an anatomical and functional guided protocol for optimizing resources in LMICs for surgical brain mapping in eloquent area diffuse glioma.

1211

## Oncology

ePoster presentation

Therapy defining at initial diagnosis of primary brain tumor- the role of <sup>18</sup>F-FET PET/CT and MRI

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**Objectives:** The aim of our single center retrospective study was to test the primary diagnostic role of amino acid PET/CT compared to enhanced MRI.

**Background:** Primary malignant brain tumors are heterogeneous and infrequent neoplasms. Their classification, therapeutic regimen and prognosis have undergone significant development requiring the innovation of imaging diagnostic. Performance of enhanced magnetic resonance imaging depends on blood brain barrier function. Several studies have demonstrated the advantages of static and dynamic amino acid PET/CT providing accurate metabolic status in the neurooncological setting.

**Methods:** We compared the performance of diagnostic modalities in accordance with the actual histological diagnosis. In order to test screening ability of enhanced MRI and FET PET/CT sensitivity, specificity, positive predictive value and negative predictive value were calculated. We evaluated the correlation between SUVmax, TBRmax, Ki-67 (a nuclear protein associated to cell proliferation) and tumor grading with Student's t-test or Mann-Whitney test, depending on the distribution of samples.

**Results:** In our analysis for newly found brain tumors <sup>18</sup>F-FET PET/CT outperformed contrast MRI and PWI in terms of sensitivity and negative predictive value (100% vs 52.9% and 36.36%; 100% vs 38.46% and 41.67%), in terms of positive predictive value their performance was vaguely the same (84.21 % vs 90% and 100%), whereas regarding specificity contrast MRI and PWI were superior (40% vs 83.33% and 100%).

**Conclusions:** Based on these results superiority of <sup>18</sup>F-FET PET/CT seems to present incremental value during the initial diagnosis. In the case of non-enhancing tumors, it should always be suggested as therapy determining test.

1212

## Skull Base

Oral presentation

Tuberculum sella meningiomas: choosing the approach? A critical evaluation of factors influencing outcomes

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**Objectives:** To analyse and compare outcomes between endoscopic and transcranially resected tuberculum sellae meningiomas over the last 8 years. The parameters of comparison include outcomes in form of operative approach, post-operative outcomes and complications, visual outcomes and factors affecting gross total resection.

**Background:** While Endoscopic approaches have become standard of care in pituitary adenomas, there exists a debate as to their usage in meningiomas. In this study of our experience with these tumours, we analyse our experience and also aim to understand better the rationale for selection of endoscopic versus microscopic approaches in these formidable set of tumors.

**Methods:** In this retrospective observational study, we have included cases of tuberculum sellae meningiomas operated by the authors over the last 8 years. The demographic profile, clinical features, surgical approaches, outcomes and complications have been analysed.

**Results:** There were a total of 107 patients operated during the period, among these 87 were selected for the study as 20 patients did not have a follow-up. The median age of patients was 44 years. 58 patients underwent microsurgical excision while 29 underwent endoscopic excision. 77/87 had visual improvement or visual stabilization after surgery while 10/87 patients had visual deterioration. Among the visual improvement group, 22/29 (75.86%) patients were from the endoscopic group and 34/58 (58.6%) were from the transcranial group. Anosmia was the most common complication observed and was highest among endoscopic groups. There was no significant difference between the gross total resection rate of the two groups.

**Conclusions:** Both Extended Endonasal endoscopic approach (EEA) and transcranial approach (TCA) have their own merits and demerits, the selection of approach depends on the anatomy of the tumour and its relation to the intracranial vessels and the experience of the surgeon.

1213

## Functional

Oral presentation

### Deep brain stimulation in pediatric dystonia: our experience

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**Objectives:** Pediatric dystonia (PD) has a significant negative impact on the growth and development of the child.

**Background:** This study was done retrospectively to analyze functional outcomes in pediatric patients with dystonia who underwent deep brain stimulation.

**Methods:** In this retrospective analytical study, all the patients of age less than 18 years undergoing DBS for dystonia between 2012 and 2020 in a single center were analyzed and their functional outcomes were measured by the Burke–Fahn–Marsden-dystonia-rating-scale (BFMDRS).

**Results:** A total of 10 pediatric patients were included with a mean age of onset, duration of disease, and age at surgery being 5.75 years, 7.36 years, and 13.11 years respectively with a mean follow-up of 23.22 months. The mean pre-DBS motor score was  $75.44 \pm 23.53$  which improved significantly at 6 months and 12 months follow up to 57.27 (p value 0.004) and 50.38 (p value <0.001) respectively. Limbs sub-scores improved significantly at both the scheduled intervals. There was a significant improvement in disability at 1-year follow-up with significant improvement in feeding, dressing, and walking components. There was 27.34 % and 36.64 % improvement in dystonia with 17.37 % and 28.86 % reduction in disability at 6 months and 12 months respectively. There was a positive correlation between the absolute reduction of the motor score and improvement in disability of the patients at 6 months ( $\rho = 0.865$ , p value 0.003).

**Conclusions:** This is the second-largest study reported in the world in pediatric dystonia from a high-volume tertiary care center with a dedicated movement disorder team. DBS in carefully selected cases of pediatric dystonia has a significant role in reducing disease burden and a sustainable therapeutic goal is achievable in most cases when performed by a dedicated team with the required expertise.

1214

## Neurovascular Surgery

Oral presentation

Complex MCA aneurysms – management strategies

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**Objectives:** Analyse our outcomes for complex MCA aneurysms

**Background:** Middle cerebral artery (MCA) aneurysms are one of the most common group of aneurysms. Among the, Complex MCA aneurysms management need special care and technique for optimal management. In this presentation, we discuss management strategies for complex MCA aneurysms.

**Methods:** We analyzed our experience on complex MCA aneurysms operated at NIMHANS from over the last 10 years. Complicated aneurysms were defined as which were large (1.5 Cm) or Giant (>2.5 cm), had multiple vessels arising from the aneurysm domes or in which the neck was large and incorporated the MCA trunks, dissecting aneurysms and those that cannot be treated by endovascular methods or recurrent aneurysms following coiling.

**Results:** There were a total of 362 MCA aneurysms operated over the last 10 years of which 64 why were designated to be complex aneurysms. They underwent various types of surgeries including clipping, reconstructions, low flow bypass or high flow bypass. The management strategies, results and outcomes are discussed in depth. These include, Clipping reconstruction and variety of bypass techniques including low flow and high flow bypasses.

**Conclusions:** Complex MCA aneurysms require a variety of management techniques. In this presentation, we discuss planning strategies, techniques and surgical nuances as well as outcomes of this complex set of aneurysms.

1215

## Spine

Oral presentation

### Investigation of adjacent segment disc biomechanics in lumbar disc and lumbar fusion surgery

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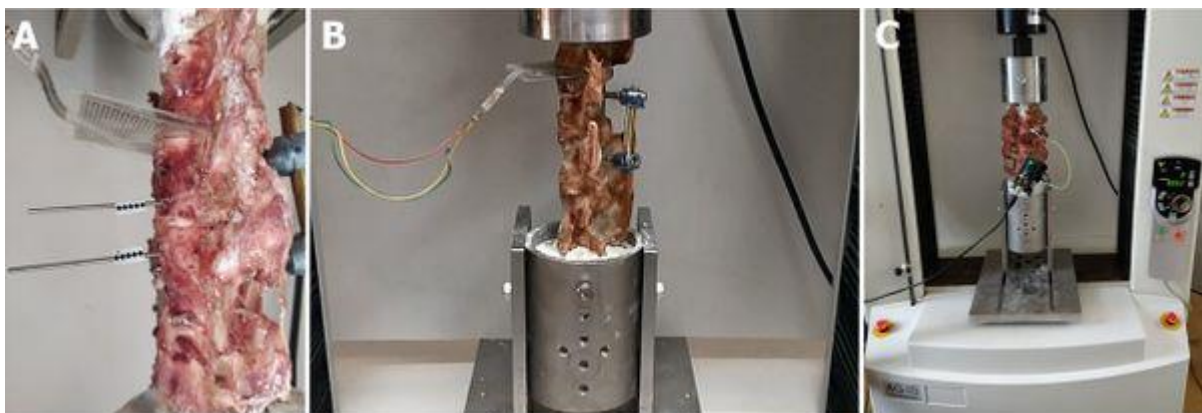
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**Objectives:** The aim of our study is to contribute to the literature by measuring the load during axial loading at the adjacent disc distance after different spinal surgery techniques.

**Background:** After lumbar disc herniation and lumbar stenosis surgery, degenerative changes occur in the upper segment disc distance. Whether these changes are post-operative or a natural consequence of spinal degenerative disease has not been proven.

**Methods:** In our study, 30 sheep spines were used. There were 5 groups: Group I (n=6); control, group II (n=6); unilateral hemilaminectomy and discectomy were performed, group III (n=6); total laminectomy was performed, group IV (n=6); two levels of lumbar fusion were performed, group V (n=6); two levels of lumbar fusion and laminectomy were performed. In this study, the load on the disc and the total load between L1-L5 were measured with the help of the FSR406 sensor from the L2-L3 disc space by performing surgery on the L3-4 segments. A universal axial compression machine was used for all tests (AG-IS 5 kN, Shimadzu Corporation, Kyoto, Japan). Recorded and analyzed with TRAPEZIUM X Materials Testing Software (version 1.1.2) during 400N axial compression. The nonparametric Mann-Whitney U test (SPSS, v. 15.0; SPSS, Chicago, IL, USA) was used for statistical analysis between groups.

**Results:** There was a significant difference between groups I and IV in flexion ( $p=0.016$ ), Flexion FSR ( $p=0.037$ ). There was a significant difference in compression ( $p=0.037$ ) and flexion FSR ( $p=0.020$ ) between groups I and V.



**Conclusions:** When the results are examined in general, the pressure in the adjacent segment increases after the surgery. In this study, it was observed that intradiscal pressures increased after the expansion of these techniques and after fusion surgery, especially after flexion. This pressure increase may lead to the development of adjacent segment disease in the future.



1217

## Oncology

ePoster presentation

### Challenges in intraventricular meningiomas surgery, case presentation and review of the literature

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**Objectives:** Review on the management of meningiomas of the ventricular atrium according to what has been reported in the literature and in the experience of our institution.

**Background:** Intraventricular meningiomas represent 3 to 5% of meningiomas. Approaches are suggested depending on tumor location and extension, proximity to eloquent areas or pathways (motor, sensory, optic radiation, language), vascular pedicles. In this case, it is a 41-year-old female patient who presents a stabbing headache in the left parieto-temporal region with an intensity of 7/10. Clinically mental functions with impaired retrograde memory and anterograde, acalculia, preserved judgment and abstraction, bradialia, bradypsychia, for which he went for evaluation and a cranial tomography study with contrast was carried out, evidencing intraventricular extra axial tumor lesion, for which he underwent surgical procedure through excision of a probable left intraventricular extra axial lesion meningioma vs choroid plexus papilloma.



**Methods:** A bibliographic review on the surgical management of atrioventricular meningiomas and the experience at our institution was carried out.

**Results:** For meningiomas of the trigone, the superior transparietal or interparietal sulcus approach, with late access to the vascular pedicle and a long corridor to the lesion, provided the best option for tumor evacuation without interrupting optical radiation. Therefore, the patient presents adequate post-surgical evolution, clinically finding impaired retrograde and anterograde memory, acalculia, preserved judgment and abstraction, bradilalia, bradypsychia. 14 point glasgow comma scale (O 4 V4 M6).

**Conclusions:** When the endoscopic endonasal technique is not successful, the extradural subfrontal technique is recommended for direct sealing of the defect and it is important to assess IIH data during follow-up.

1219

## Spine

ePoster presentation

Case report: a 86-year old male with T2 - T11 subacute spontaneous medullar subdural hematoma + complete medical syndrome since T12

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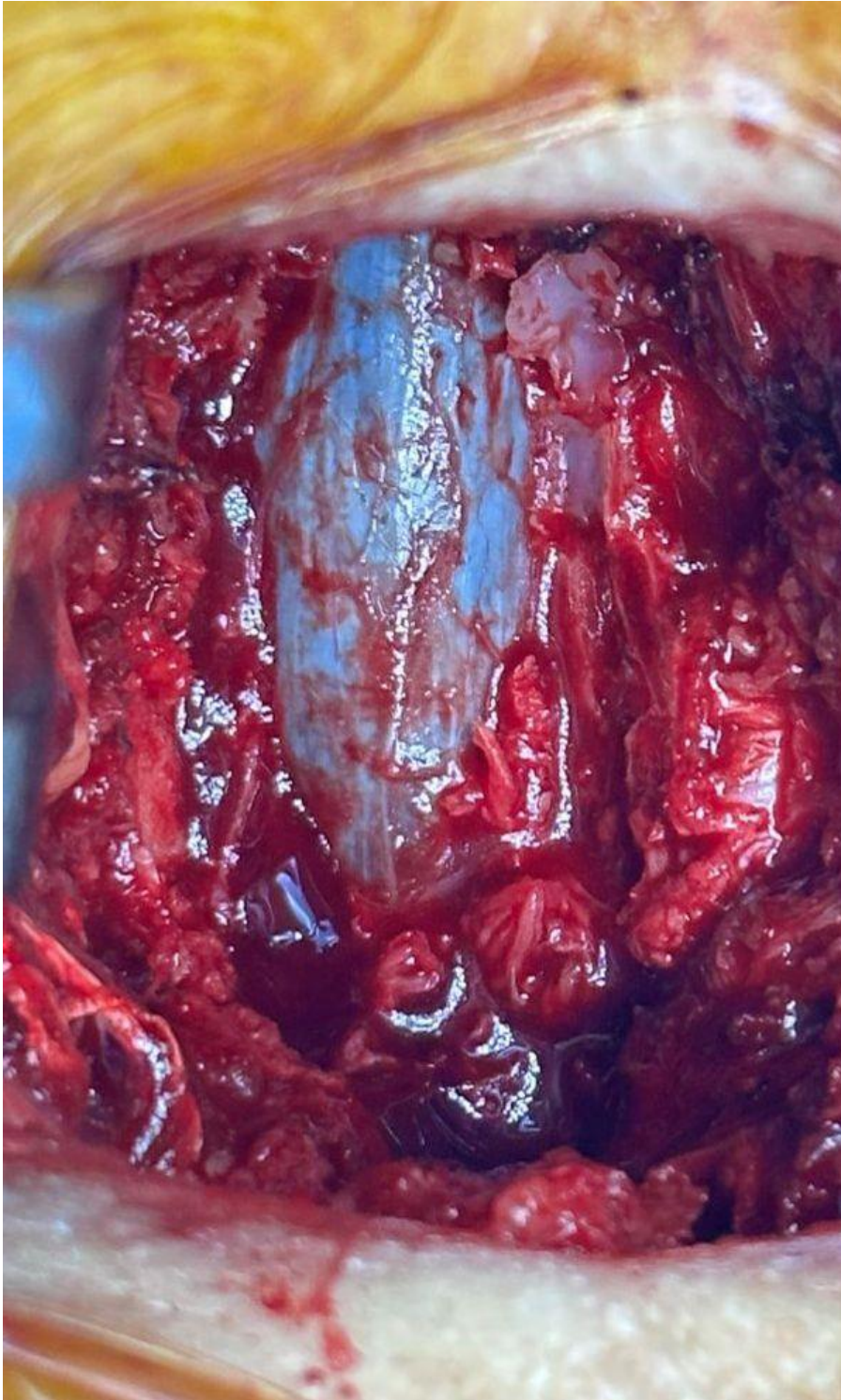
**Objectives:** Early identify a clinical picture suggestive of spontaneous medullar subdural hematoma for the prevention of long-term motor sequelae. Timely approach through laminectomy and drainage of subdural medullary hematoma.

**Background:** This is a male patient in the ninth decade of life, who was admitted to the emergency service due to gastroparesis and paraparesis. Therefore, an assessment is requested from the general surgery service who discarded abdominal pathology. Due to increased neurological deterioration at the sensitive and motor level, a thoracic magnetic resonance is requested where a subdural hematoma of T2 - T11 is evidenced.

**Methods:** Study methods should focus on the early identification of a spinal cord syndrome, as well as important history such as anticoagulant ingestion or recent falls in patients in the ninth decade of life.

Achieve an early identification of a complete spinal cord syndrome to prevent permanent motor and sensory sequelae.

**Results:** Patient who underwent drainage of a subdural and medullary subarachnoid hematoma by means of a posterior thoracic approach through a T12 laminectomy + laminoplasty with titanium miniplates. With no data on cerebrospinal fluid fistula, and partial improvement in mobility and sensitivity in the lower extremities. Also in follow-up by the physical therapy and rehabilitation service.



**Conclusions:** Patient undergoing emergency surgery through laminectomy and drainage of a subdural medullary hematoma, with partial recovery of sensitivity and strength in the lower limbs. likewise, make emphasis on the early approach to prevent permanent complications.

1220

## Hydrocephalus

ePoster presentation

Case report: A 37-year old male patient with a diagnosis of triventricular noncommunicating hydrocephalus secondary to hemorrhage in the left cerebellar hemisphere

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**Objectives:** Patient with four days of evolution, in symptomatic treatment to control nausea and headache. Perform a medial suboccipital approach to improve noncommunicating hydrocephalus. The importance lies in timely diagnosis to prevent permanent neurological sequelae, as well as control of noncommunicating hydrocephalus with emergency external ventricular drainage placement.

**Background:** This is a male patient in the fourth decade of life who presents cerebellar syndrome. Therefore, he went to the emergency department where a cranial tomography study was carried out, revealing hemorrhage in the left cerebellar hemisphere as well as non-communicating hydrocephalus. Therefore, he underwent a medial suboccipital craniectomy excision of the hemorrhagic lesion and placement of an external ventricular shunt drain. With improvement in neurological status 24 hours after the surgical procedure. Also in follow-up with the physical therapy and rehabilitation service. Clinically with 15-point glasgow coma scale and left cerebellar hemisphere syndrome.



**Methods:** Preparation of emergency medial suboccipital approach in patients with no chronic degenerative history for prevention of permanent sequelae as well as control of hydrocephalus through external ventricular drainage.

**Results:** Patient who underwent an emergency surgical approach through medial suboccipital craniectomy, tumor excision, placement of an external ventricular shunt drain with adequate post-surgical evolution, in follow-up with the physical therapy and rehabilitation service. with study of histopathological report of hemorrhage lesion without data of tumor apoplexy.

**Conclusions:** Patient admitted with a 3-point Glasgow coma scale (O1 V1 M1) for which a medial suboccipital craniectomy was performed, placement of an external ventricular shunt drain. with adequate post-surgical evolution, under follow-up by the physical therapy and rehabilitation service. with left cerebellar hemisphere syndrome, without other alterations. Patient who sent a sample due to suspicion of tumor apoplexy, however spontaneous cerebellar hemorrhage was reported.



1221

## Hydrocephalus

ePoster presentation

Dysfunction of the ventricular peritoneal shunt system due to exclusion of uterine leiomyoma: case report

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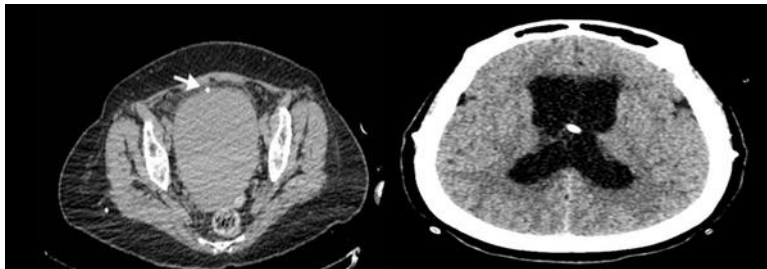
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**Objectives:** Multidisciplinary approach for the identification of ventriculoperitoneal dysfunction as well as participation of the general surgery service for resolution of underlying pathology. Identification of therapeutic options for the resolution of ventriculoperitoneal dysfunction, as well as the ventriculoatrial technique.

**Background:**

The ventriculoperitoneal shunt system is the fundamental pillar of hydrocephalus management; however, it is an intervention that tends to be associated with complications, although dysfunction secondary to abdominal injuries is rare in the literature.



**Methods:** Female patient admitted with clinical and imaging data of dysfunction of the ventriculoperitoneal shunt system and underlying hydrocephalus, reason for which she required admission to the neurosurgery service to complement with studies, however to the multidisciplinary assessment with documentation of uterine myomatosis, increased size of the This is generating exclusion of the shunt and occlusion of it.

**Results:** She required removal of the ventricular peritoneal shunt system and replacement with a ventricular atrial shunt for subsequent excision of the abdominal lesion. In the post-surgical follow-up, the patient presented a decrease in headache episodes. No added complications on the exeresis of the uterine lesion. Without presenting aggregate neurological deterioration.

**Conclusions:** The multiple external factors that can cause dysfunction of the ventricular shunt systems must be identified in order to use the most appropriate technique. Likewise, the participation of multiple services such as general surgery for the excision of the neoplastic lesion of the uterus is of the utmost importance.

## Global Neurosurgery

ePoster presentation

### Risk factors of post-suboccipital craniotomy headaches

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**Objectives:** We conducted a retrospective multicentre cooperative study to investigate the epidemiology, risk factors, clinical course, and prognosis of post-suboccipital craniotomy headaches. This study aimed to establish the actual clinical incidence and causes of post-suboccipital craniotomy headaches and to contribute to their diagnosis and prevention.

**Background:** The detailed epidemiology and mechanism of post-craniotomy headaches are not well understood.

**Methods:** Suboccipital craniotomy surgeries performed in six institutions within the 5-year study period were included. This study included 311 patients (138 males, 173 females; mean age, 59.3 years old). All patients were followed up for more than 6 months.

**Results:** A total of 145 patients (49%) experienced post-craniotomy headaches. Microvascular decompression surgery, craniectomy, and facial spasms were significant risk factors for post-craniotomy headaches. In most cases, the post-craniotomy headaches disappeared within 1 month. However, in 10 patients (7%), post-craniotomy headaches persisted for more than 91 days following surgery. Furthermore, in five patients whose headaches started more than 8 days after surgery, the headaches became chronically persistent for more than 130 days.

**Conclusions:** The craniotomy site and the methods of dura and skull closures should be individually determined for each patient. However, to prevent post-craniotomy headaches, craniotomy, instead of craniectomy, may be considered.



1223

## Paediatric

ePoster presentation

### Hydrocephalus due to ethelyn glycol intoxication rare case: cases-report study & literature review

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**Objectives:** To show that intoxication of Ethelyn glycol can lead to neurosurgical problem and also to show if neurosurgical interventions are needed to treat the problem.

**Background:** Ethelyn glycol intoxication was an endemic health problem in Indonesia at the end of 2022 due to many of children's medications contain it that lead to tens of children loss their live. Ethelyn glycol caused acute kidney injury when given in a certain dose. Many patients then undergo haemodialysis to treat the acute kidney injury. Hydrocephalus due to kidney failure is very rare, there was a study found that hydrocephalus occurred maybe due to failure of the drainage system of the ventricle due to accumulation of toxic compound in the blood which lead to failure of the ventricular drainage system.

**Methods:** We collect 3 cases of communicating hydrocephalus associated with Ethelyn glycol intoxication which all 3 patients underwent haemodialysis. Then we performed VP shunt operation in 1 patient and observation in 2 patient. We followed up the patients for > 6 months and score their clinical symptoms and daily functional capability.

**Results:** Ethelyn glycol intoxication leads to multiple system failure especially renal failure. Hydrocephalus developed after kidney failure required haemodialysis. 1 patient we performed VP shunt due to signs and symptoms of acute increase intracranial pressure. The other 2 patient we observed. The patient underwent surgery doing well and also with 2 patients that we observed only.

**Conclusions:** There is no significant difference between patient who got vp shunt surgery and did not. But many cases that are not yet discovered that need further studies that corrolate with hydrocephalus due to ethelyn glycol intoxication.

1225

## Neurovascular Surgery

ePoster presentation

The future of stem cell therapy for stroke in neurosurgical perspective

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**Objectives:** Stroke is one of the leading causes of death and physical disability worldwide. During the past several decades, great efforts have been made to understand the pathological process and develop therapeutic strategies for reducing neuronal loss and improving neurofunctional restoration after stroke.

**Background:** It has been more than 15 years since clinical trials of stem cell therapy in stroke patients have been conducted. Results of randomized controlled trials showed that stem cell therapy was safe but its efficacy was modest.

**Methods:** Nowadays, stem cell research for stroke is still a rapidly progressing, multifaceted research area.

**Results:** Compare to previous neuroprotective treatments, stem cell therapy in stroke is thought to have longer windows of administration and fewer exclusion criteria for clinical indications. However, issues regarding cell sources, delivery route, number of cells needed, the timing of transplantation, homing to the lesion site, long-term safety and efficacy, and cell tracking are examples of some bottlenecks in the translational process.

**Conclusions:** Here, we discuss the current data and progress of stem cell therapy for stroke and how neurosurgery is involved in the research and future practice.

1226

## Global Neurosurgery

ePoster presentation

Cranial keyhole surgery: past, present and future

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**Objectives:** Along with advances in diagnostics and techniques in the field of neurosurgery, the minimally invasive keyhole surgery technique has increasingly developed and is widely used among neurosurgeons.

**Background:** Although keyhole surgery is often considered minimally invasive, the primary objective of this approach is to achieve maximal surgical efficiency by avoiding unnecessary exposure.

**Methods:** So the purpose of this technique is to do smaller openings with the added benefits of shorter procedures, fewer wound complications, and better patient outcomes. However, can this procedure be done in the future for all intracranial abnormalities? Of course, many factors influence it.

**Results:** The author will explain based on reports from other centers and personal experience in conducting cranial keyhole surgery procedures, especially about philosophy, case selection, and its relationship with residency training.

**Conclusions:** The author considers, this procedure is the future of neurosurgery and its use will be increasingly widespread along with the advancement of techniques and neurosurgical facilities, which of course, also growing in the future.

1227

## Trauma

ePoster presentation

Traumatic brain injury in pregnancy: defining appropriate guideline

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**Objectives:** Defining appropriate neurosurgical guidelines for traumatic brain injury in pregnancy.

**Background:** Even mild, head injury during pregnancy can threaten either the maternal or the fetal life. The risk is associated with systemic and cerebral consequences of rapidly expanding mass lesions, high intracranial pressure, hypotension, anoxia, or anemia.

**Methods:** Although the initial assessment and management priorities for resuscitation of the head-injured pregnant patient are the same as those for other head-injury patients, the specific anatomic and physiologic changes that occur during pregnancy may alter the response to injury and hence necessitate a modified approach to the resuscitation process and neurosurgical management.

**Results:** We proposed a new and specific neurosurgical management guideline for a severe head injury in this complex and multidiscipline case.

**Conclusions:** To the best of the author's knowledge, this is the first specific guideline for the management of severe head injury in pregnancy.

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## Oncology

Oral presentation

### Approaches to ventral brain stem lesions

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**Objectives:** To look at the safety and efficacy of approaches to ventral Brain stem lesions.

**Background:** Technological advancements have made brain stem lesions operable. However, the majority of lesions operated are exophytic, dorsal and close to a pial surface. Ventral lesions have been thought to be “non-operable” as results were often poor. The use of technology and the better understanding of anatomy has made these ventral lesions approachable and operable with good results.

**Methods:** A retrospective study was done of the brain stem lesions operated over the last 20 years. The ventral lesions were then studied for location, approach used, outcome and pathology.

**Results:** 108 patients with brain stem lesions were operated between 2003 and 2023. Thirty- six were ventrally located. The lesions were Thalamo-peduncular or Midbrain in 13, Pontine in 14 and Medullary in 9. The approaches used were Antero-lateral basal for Midbrain lesions. A Para-oculomotor entry was used to access the lesions. Pontine lesions were approached using retrosigmoid approach and a para-trigeminal entry. The medullary lesions were accessed using a far lateral infratonsillar approach and a para-olivary entry. Navigation and intra-operative monitoring were used in majority of cases. The pathologies encountered were Gliomas (21/36) and cavernomas (12/36) with other pathologies seen rarely.

Maximal safe resection was done in the gliomas while a radical excision was performed in the cavernomas. There was transient worsening of neurology in 5/21 gliomas, with new cranial nerve deficits in 4 patients. Most patients improved in their neurology at discharge.

**Conclusions:** A Ventral location of a brain stem lesion does not preclude surgical excision. Classical approaches with modifications suitable for the individual case allows access to the lesions. The combination of advanced neuroimaging and intraoperative adjuncts along with good microsurgical techniques helps deliver good results.

## Skull Base

ePoster presentation

### Minimally invasive neurosurgery in Albania, personal experience

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**Objectives:** To review the indications and results of minimally invasive neurosurgery.

**Background:** A minimally invasive surgical procedure is safe and is associated with a lower postoperative patient morbidity compared with a conventional approach for the same operation. At the seat of success of minimally invasive surgery is the constant upgrading of surgical instruments. Nevertheless minimally invasive neurosurgical procedures still have potential intra- and post-operative complications that can cause morbidity and mortality. We must prove that minimally invasive techniques do in fact produce equal, if not better, results and can be done with less trauma and less risk to the patients, with benefits of cost reduction.

**Methods:** The operative charts of the author were reviewed retrospectively for minimally invasive interventions in the last three years. For the identified cases clinical data, imaging, intraoperative videos, post-operative neurological exams were collected.

**Results:** Different pathologies were operated – pituitary adenoma, tuberculum sellae meningioma, spheno-orbital meningioma, orbital epidermoid cyst, cerebral abscess, trigeminal neuralgia, frontal basal epidermoid cyst, intraventricular tumor. In all cases the result of the surgery was equal or better than the standard approach. In two cases, the conversion to the minimally invasive approach was dictated by the inability of the standard approach to achieve the desired result.

The postoperative period was shorter, the cosmetic result was better and the post-operative pain was lower.

**Conclusions:** Minimally invasive approaches are the new frontier in neurosurgery, and technological innovation and integration are crucial to ongoing progress in the application of these techniques.

Minimally invasive neurosurgery advantages include accurate localization of lesions usually inaccessible to conventional surgery, less trauma to healthy brain, blood vessels and nerves, shorter operating time, reduced blood loss, and early recovery and discharge. We have started to apply with good results these techniques and need to expand its use.

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## Skull Base

Oral presentation

Surgical management of trigeminal schwannomas: defining the role of various approaches

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**Objectives:** This is a retrospective analysis of 99 consecutive patients with trigeminal schwannoma surgically managed from over a period of 33 years.

**Background:** While 49 tumours were located in a single compartment {Meckel's cave (MF) 30, posterior fossa (PF)21}, 44 were dumbbell-shaped {PF-MF in 37, MF-extracranial 7}. In one case, the tumour was totally extracranial and in three others it occupied all 3 compartments.

**Methods:** All 8 patients managed until 1992 were operated on by conventional approaches. With the exception of the 21 patients with posterior fossa tumors and ten with dumbbell PF-MF tumors which were treated by the retromastoid route and three with MF tumor treated by the standard subtemporal approach, all other 57 cases managed since 1993 were operated on by the skull base approaches.

**Results:** Tumour could be radically removed in 85 patients and decompressed in fourteen. The only operative mortality was in a patient with residual/recurrent tumour who developed meningitis. Seven patients were operated for symptomatic recurrences.

**Conclusions:** Most multi-compartmental trigeminal schwannomas can be radically removed using a single-stage fronto-temporal interdural skull base approach. Currently endoscopic approaches appear to be well suited for trigeminal schwannomas restricted to Meckel's cave and or / extracranial segments. The choice of strategy (endoscopic or transcranial) for tumors restricted to Meckel's is still a matter of debate but might one day be dictated by tumour – nerve anatomical situation. Rapid progress in diffusion tensor imaging MRI sequences will soon allow the surgeon to determine whether trigeminal nerves are displaced medial or lateral to the tumor. Transcranial approaches will then be more suited for tumors that displace nerve medially while endonasal techniques might be more suited for tumors that displace these nerve fibres laterally.

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## Skull Base

Oral presentation

Changing concepts in the operative management of petroclival meningioma: reverting back to retrosigmoid approach

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**Objectives:** A retrospective analysis of 130 cases of petroclival-premeatal meningiomas surgically managed over a period of 25 years was carried out to see the outcome with various approaches.

**Background:** While the tumor resection was carried through an anterolateral/lateral route in 35(23%), it was through a combined posterior subtemporal /pre or trans-sigmoid (posterior petrosal) in 24(19%) & retrosigmoid supra-paracerebellar route in 62 cases (47%). In three cases with extra cranial extension to infratemporal area, a modified Fisch approach was used. Six patients who were in poor clinical condition had only a CSF diversionary procedure.

**Methods:** The tumor could be radically removed in 78 patients (63%), subtotally in 27 (22%) and decompression only in 11. Seven patients had tumor excision in two stages. There was an operative mortality of 7.7% (10 cases).

**Results:** Forty four of the 60 patients who underwent surgical decompression since Jan 2004 were operated by the retrosigmoid route and operative mortality for this group of 53 patients was 3.3% (2 cases). There was only one operative mortality among the last 43 cases operated by the retrosigmoid route. Out of the 97 patients on long term follow up 67 are independent. Eleven out of the thirteen patients who had symptomatic recurrence were re-operated. The percentage of these tumors operated by conventional retrosigmoid route has increased in the later part of the series thus proving that in many of these tumors without significant middle fossa extension, it is not necessary to use complex and time consuming skull base approaches which in themselves can cause morbidity.

**Conclusions:** Many of the premeatal-petroclival meningiomas without significant middle fossa extension can be removed by conventional retrosigmoid route with reduced morbidity and mortality.



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## Skull Base

Oral presentation

Pathological anatomy of arachnoid in large vestibular schwannomas and its relevance to facial nerve preservation: personal experience of 835 cases

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**Objectives:** An understanding of the mechanism of formation of arachnoid fold around vestibular schwannoma is crucial in preserving the anatomical integrity of 7th nerve.

**Background:** The author with an operative experience of 835 vestibular schwannomas, describes technical details of facial nerve preservation in large tumors.

**Methods:** These tumors originate in the subarachnoid space of IAC and this concept is quite different from the widely accepted concept by Yasargil, which postulated that these tumors originate in the epiarachnoid space at the lateral end of the canal. The mechanism of formation of arachnoid fold over the tumor surface in its cisternal portion is by a different mechanism. As these tumors grow they get adhered to the arachnoid and dura at the porus and with further increase in size, this arachnoid adhesion moves towards the angle resulting in an overlap of arachnoid membrane.

**Results:** The essential understanding needed to successfully execute surgery on a vestibular schwannoma is to realize that the perineurium of the vestibular nerve forms the capsule of the schwannoma and the cochlear and facial nerves lie directly over this capsule without any intervening arachnoid layer. The intracanalicular component of the tumor is removed by performing a tailored drilling of internal auditory canal. After reduction of the tumor volume, continued perineural dissection of the tumor is carried out without opening the arachnoid over the fifth and lower cranial nerves, which are in separate cisterns. Total resection may not be feasible in some cases and if the tumor cannot be dissected from 7th and auditory nerve, a sub-perineural dissection is advised.

**Conclusions:** Neurosurgeons should strive to keep anatomical integrity of 7th nerve even in large acoustic tumors.

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## Oncology

ePoster presentation

Cervical intramedullary tumors and its mimicks: avoiding Maslow's hammer

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**Objectives:** Intramedullary spinal cord tumors at times may cause significant difficulties in differentiating between inflammatory and vascular lesions.

**Background:** Neurosurgeons are often asked to evaluate patients for spinal cord biopsies when pre-surgical neuroimaging demonstrate inconclusive findings. Sometimes both non neoplastic and neoplastic intramedullary pathology may have similar clinical presentation and even CSF findings which also compound the issue.

**Methods:** Although cord enlargement is the hall mark of tumors, this can also occur in acute inflammatory setting. Inflammatory lesions most often demonstrate patchy and peripherally situated enhancements and these are less common for neoplasms. A ring enhancement is not seen for tumors, while presence of intratumoral and peritumoral cysts are common for neoplasms.

**Results:** The importance brain imaging, visual and fundus examination and CSF studies in situations of diagnostic dilemmas with operative videos of clinical cases will be presented.

**Conclusions:** If neurosurgeon is unsure a longer observation of the clinical course with empirical treatment and follow-up MR would be a more prudent approach if patient is not rapidly deteriorating. Author will show video presentations of various intramedullary tumors.

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## Functional

Oral presentation

### Microvascular decompression for intractable tinnitus

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**Objectives:** To look at the efficacy of Microvascular decompression surgery in Intractable Tinnitus.

**Background:** Microvascular decompression (MVD) though proposed as treatment for tinnitus in the 1960s has not gained widespread acceptance due to variable results, and poor selection criteria. With advanced MRI imaging, and improved selection criteria, there has been a renewed interest in the procedure, showing it as safe and successful.

**Methods:** A study was done on patients operated for intractable tinnitus between March 2021 and June 2023. The patient selection was based on a negative ENT report, high Tinnitus Handicap Index (THI), negative psychology report and a positive MRI for neuro-vascular conflict. Patient counselling was an important part of the pre-operative workup.

**Results:** Twenty-six MVD procedures were performed in 21 patients in the time period mentioned. The average THI was 77.4 (range 56-98). MRI showed varied conflicts Grade 1 in 5, Grade 2 in 4, Grade 3 in 11 and Grade 4 in 4 patients. Bilateral surgery was performed in 5 patients. A Retromastoid craniotomy was done under neuro-monitoring. Significant neurovascular conflict was found in all 26 procedures.

Improvement in the Tinnitus was seen in a graded fashion. The patient disability was an average 71% (40-100 range) on the 1<sup>st</sup> post-operative day, 58% (30-100) on the 7<sup>th</sup> post-operative day and 41% (10-100) at 1 month. Of the 21 patients, 4 patients did not have significant improvement in their Tinnitus with disability staying above 80%, even after 6 months. The other 17 patients all gradually improved in their symptom with 4 patients reporting complete disappearance at 5 months.

The only post-operative problems were severe nausea (10/21) and vertigo (6/21).

**Conclusions:** Microvascular Decompression of the Vestibulo-cochlear nerve should be considered an option in selected patients with intractable tinnitus. Surgery carries low risk. However, improvement is seen only 80.9% of patients over a period of time.

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## Neurovascular Surgery

Oral presentation

Clipping or coiling of brain aneurysm-expertise and bias influencing patient outcome

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**Objectives:** 1. Complication assessment of such procedures.  
2. Team approach to give the best to the patient.

**Background:** In spite of various trials and statistics, the decision making between clipping and coiling of aneurysms is often difficult. While adequate clipping results in cure for the patient, surgery has its inherent risks. The training for radiologists to be experts in Interventional treatment, although has caught up recently, was an important issue especially at and following the time of the ISAT and similar trials. Hence, there was some sort of bias in the recommendation for the better treatment of brain aneurysms. We will discuss these issues in our series of cases, taking into the above factors into consideration.

**Methods:** All patients of SAH with aneurysms on CTA or DSA were selected for the study. The options of clipping and coiling were discussed with the patients and their families. The team consisting of experienced vascular surgeons and Interventional neuro-radiologists in consultation with the patient and their family decided the procedure to be adopted in individual cases. Post-operative and post-procedural results were recorded. Complications were noted and necessary correctional treatments were done.

**Results:** The study involved 220 patients from June 2010 till May 2023.

81.8% patients received microsurgical clipping. Coiling was performed for 10% patients. ACOM was the most common site for ruptured aneurysm. Overall, 72.7% of those treated had a good outcome (Glasgow Outcome Score of 4 and 5). The good outcome was higher among microsurgery groups (73.7%) compared to the coiling group (63.6%) but this difference did not achieve statistical significance ( $\chi^2 = 0.46$  P = 0.4976).

**Conclusions:** Clipping achieved better result in our series, considering the round the clock availability of experienced surgeons, availability of operative facilities, intensive care monitoring and especially affordability, which is very important in the society we serve.

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## Oncology

Oral presentation

Is microscopic trans-sphenoidal surgery history?

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**Objectives:** 1. Whether there is any role of Microscopic Trans-sphenoidal Surgery(TSS) in Pituitary Tumours(PT), when Endoscopic approach has been widely accepted for the same.  
2. To compare results of both Endoscopic (ES) and Microscopic(MS) TSS done by one team in 147 consecutive cases of PT.

**Background:** Before the re-introduction of endoscopy in TSS Pituitary surgery, MS was the mainstay for majority of centrally located PT. Most major centers were reporting good results and acceptable levels of complications and recurrences. When ES was gradually popularized with more and more surgeons mastering the technique, number of surgeons preferring MS declined and most took the transition to the latter. We analyzed our results of both MS and ES randomly selected in 147 consecutive cases of operated Pituitary adenomas performed by the same surgeons in the same centre.

**Methods:** We looked at our last 147 cases of PT operated in our centre by TSS route over last 13 years in our centre. The demographic data and procedures adopted in each case was recorded. Results of the surgery and the complications(CSF leak and DI) were also recorded. The results were analyzed using standard statistical methods.

**Results:** 65.75% underwent MS and 34.25% ES. Incidences of CSF leak was equal in both. DI was seen more in MS group, where as visual improvement was seen more in the MS group. Safety profile and early results were comparable in both groups. Incidences of long term recurrence need longer follow up.

**Conclusions:** Microscopic procedure remained a well-established procedure in our centre. There was no significant difference in the safety profile and the early outcome in the two approaches.

## Oncology

ePoster presentation

### Long-term survival and treatment approaches in glioblastoma: a comprehensive study in a lower middle-income country

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**Objectives:** This study aimed to evaluate the long-term survival outcomes and treatment approaches in patients with glioblastoma (GBM) in a lower middle-income country and assess the impact of treatment center type on patient outcomes.

**Background:** Glioblastoma management is a complex challenge that requires sophisticated treatment protocols. However, there is limited information on long-term survival rates and treatment approaches in lower middle-income countries. Understanding the factors influencing survival and treatment outcomes is crucial for improving patient care.

**Methods:** We conducted a nationwide analysis using the National Cancer Registry of Ukraine. A total of 2973 adult patients with histologically confirmed GBM diagnosed between 2015 and 2019 were included. Survival analysis was performed using the Kaplan-Meier method and a multivariable Cox model to identify prognostic factors. Treatment center type (academic medical centers [AMCs] vs. community hospitals [CHs]) was analyzed for its association with treatment approaches and patient outcomes.

**Results:** The mean age of GBM patients was  $55.6 \pm 11.4$  years, with a male predominance (51.8%). Among the patients, 61.0% received surgical treatment combined with radiotherapy and/or chemotherapy, while only 19.0% underwent surgery followed by chemoradiotherapy. AMCs had a higher likelihood of offering combined treatment modalities (70.1%) compared to CHs (57.9%). The overall median survival was  $10.6 \pm 0.2$  months, with a 2-year survival rate of 17%. Utilization of multiple treatment modalities was associated with improved survival rates (Protocol with 2 modalities: hazard ratio 0.62, 95% CI 0.56–0.68,  $p < 0.001$ ; Protocol with 3 modalities: hazard ratio 0.48, 95% CI 0.42–0.54,  $p < 0.001$ ).

**Conclusions:** Glioblastoma management in Ukraine faces challenges: suboptimal treatment utilization and lower survival rates. Treatment center type plays a crucial role, with AMCs showing better approaches and outcomes. Enhancing access to advanced therapies and standardized protocols in all healthcare settings can improve survival outcomes for GBM patients in this population.

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## Oncology

ePoster presentation

Lessons learned from single-stage radical excision of intracranial and/or diploic tumours with concomitant implant of custom-made cranioplasty

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**Objectives:** To describe the development of a joint neurosurgical-plastic pathway for neuro-oncological management of skull eroding intracranial tumours and isolated diploic lesions.

**Background:** The radical resection of skull eroding intracranial tumours and isolated diploic lesions has been hampered so far by the challenges of reconstructing the calvarial defect with polymers or with custom-made cranioplasty at a later stage. The availability of new technologies for surgical planning and innovative materials for custom-made cranioplasty has allowed the development of a neurosurgical-plastic pathway for single stage surgical management.

**Methods:** A pilot study has been conducted between September 2021 and June 2023 on the first 10 patients referred to the Oxford University Hospitals neuro-oncology and cranioplasty MDTs. Information collected and analysed include: the decision making process regarding type of resection and reconstruction, implants' materials, perioperative complications according to Clavien-Dindo (CD) classification, preoperative and postoperative functional status, and patients' satisfaction according to FACE-Q craniofacial, a patient-reported outcome measures (PROMs) questionnaire for patients undergoing calvarial reconstruction.

**Results:** The MDT deemed that 9 out of 10 patients were suitable for surgical management; their demographics indicate a 3:2 F:M ratio with an average age of 42y at time of referral. Only 7 patients had radical tumour excision with satisfactory implant of custom-made PEEK cranioplasties, their histology included: 4 atypical meningiomas, 2 osteosarcomas, 1 intraosseous haemangioma. This pilot study recorded a 28% complication rate (CD Grade I and Grade IIIB, respectively): both complications occurred in the first 3 cases. At last follow up (median 8 months, range 2-13 months), all 7 patients demonstrated remarkable improvement in FACE-Q.

**Conclusions:** Despite a steep learning curve, single-stage radical resection and reconstruction with custom-made cranioplasty yielded excellent functional and cosmetic outcomes. A thorough patient selection was key for such success, which represents a promising step forward in the management of skull eroding intracranial tumours and isolated diploic lesions.

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## Neurovascular Surgery

Oral presentation

Multi-center study: outcomes of microsurgical treatment of complex cerebral aneurysms (OMTA) performed under conscious sedation compared to standard general anesthesia

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**Objectives:** A multi-center prospective study was designed to determine if microsurgical treatment of complex cerebral aneurysms (CCA) when performed under conscious sedation (CS) would reduce post-operative length of stay (LOS), CVA, mRS, and mortality- primary end points. Assess the reliability of SSEPs and MEPs (sensitivity and specificity) using the "awake" (control) neurological testing (Gold Standard)- secondary end points. Assess the temporary occlusion threshold of specific vessels (ICA, MCA, ICA, PCA, BA, VA)- tertiary endpoints.

**Background:** False Positives and Negatives in SSEPs and MEP's during temporary or final clip reconstruction in standard General Anesthesia (GA) can lead to poor surgical outcomes.

**Methods:** OMTA is a prospective, parallel-group, non-randomized, observational study. Phase 1 (primary center- 60 patients), Phase 2 (primary center- 142 patients), Phase 3 (multi-center- ongoing- Interim analysis). Consecutive patients with CCAs were enrolled.

**Results:** The Test Group ("Awake" n=61) when compared the Control Group (GA n=198) had slight older patients (mean age 50.7 vs 46.8), higher incidence of history of CVA (8.6 vs 6.6%), higher percentage of fusiform (13.1% vs 8.2), coiled ±stented (14.1% vs 3.3%), and large/giant+calcified+coiled±stented (12.6 vs 11.5%) aneurysms, however, there was no statistical difference in the 2 groups for these parameters. For the primary end points: Post -op Length of Stay, mRS score of ≥ 3, and CVA statistically significantly favored the "Awake" group. While the awake group had lower mortality (1.5% vs 3.3), it was not statistically significant.

**Conclusions:** Statistically significant differences were observed in 3 out of 4 primary end points. The NNT for mRS ≥ 3 was 3. [The OMTA study Central Monitoring Committee will release the interim report for the secondary and tertiary endpoints on August 15, 2023, and the data will also be available to present at the WFNS Congress]



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## Spine

ePoster presentation

Postoperative symptomatic epidural hematoma as a consequence of dried fruit



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**Objectives:** We report a case of postoperative surgical site bleeding in a healthy patient who consumed approximately 2 kg of mebos per day in the week prior to his elective spinal surgery. In addition, we aim to provide a comprehensive review of the impact of natural-occurring products in fruits and vegetables on hemostasis.

**Background:** Mebos, from the Japanese "umeboshi", is a traditional South Africa confectionary consisting of dried, pulped, sugared and brine-soaked apricots, is not only rich in fibre and vitamins but also contains natural-occurring salicylic acids, flavonoids and citric acid.

**Methods:** The clinical course of a previously healthy 54-year-old male patient with cauda equina syndrome secondary to lumbar spinal stenosis who underwent surgical intervention with subsequent bleeding into the surgical site is discussed. This was complicated by an abnormal clotting profile as was evident by rotational thromboelastometry and biochemical analysis. Mass and absorption spectrometry was applied to assess flavonoid, citric acid and salicylic acid content.

**Results:** Rotational thromboelastometry (ROTEM®) revealed an abnormal clotting profile with an increased clot forming time, suggesting intrinsic coagulopathy. Mass and absorption spectrometry revealed a high total flavonoid content as well as citric acid concentration in the mebos. Salicylic acid was at detection limits of the instrument. When comparing our findings to coagulation inhibitory values in the literature, we could illustrate the effect of flavonoids and citric acid and therefore explain the abnormal clotting profile in this patient.

**Conclusions:** Inhibition of coagulation prior to surgery is a known contraindication and may pose great risks in spinal surgery. In the present report, we demonstrated a significant association between inhibition of coagulation and an excess of the flavonoids content and citric acid concentration in mebos consumed in the days prior to elective spinal surgery.

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## Education, Ethics, Socioeconomic

Oral presentation

Development of a pediatric neurosurgical visual analytics tool to track and monitor adverse events, develop quality metrics, and improve outcomes

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**Objectives:** Accurate tracking of Adverse Events (AE) and Complications in a Pediatric Neurosurgery Service (PNS) will help to identify opportunities for Quality Improvement (QI), address any Diversity/Equity/Inclusion (DEI) deficiencies, and identify areas to provide better care while decreasing cost.

**Background:** The rate of AE's in the PNS at Johns Hopkins All Children's Hospital (JHACH) was found to be 20-22% in a limited audit in 2019. To improve our outcomes and establish a true AE baseline, we established a relational database and visual analytics tool to catalogue all neurosurgical procedures and AE's. The goal is to proactively recognize problems, identify areas for improvement and minimize cost, while improving outcomes. We will also be able to identify problems with access to care, and to provide ample material for QI research.

**Methods:** Over 1600 neurosurgery procedures performed at JHACH (Dec2019-Jun2023) have been recorded into a relational database according to their procedure type. The database, which is populated monthly, contains multiple datapoints including demographic information, procedural details, surgeon, complication type, etc., as well as socioeconomic indexes, race, ethnicity, and language. Every AE experienced by a patient has been tracked and catalogued.

**Results:** A Visual Analytics Tool has been developed using the Tableau business intelligence tool that allows for viewing and evaluation of the data in multiple ways, with a significant degree of granularity. It allows for evaluation of individual procedures over any time-frame desired, AE's, while including factors related to Diversity/Equity/Inclusion.

**Conclusions:** The Visual Analytics Tool provides a flexible tool to catalogue and analyze all our procedures and AE's. It is a powerful tool to evaluate ongoing efforts to provide equitable care, improve outcomes, and minimize cost, while allowing real time analysis to identify new problems. Drilldowns and tooltips allow users to quickly review and address granular case information.

## Global Neurosurgery

Oral presentation

Building capacity in LMICs: the madison microneurosurgery initiative's commitment to free, accessible and sustainable microsurgical training

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**Objectives:** LMICs are facing a substantial requirement for medical professionals skilled in microsurgical techniques. Madison Microneurosurgery Initiative (MMI) was founded to bridge this gap in microsurgical training by providing basic, accessible, and sustainable microsurgical training opportunities to medical professionals from LMICs in their respective countries.

**Background:** Even though modern microsurgical techniques were introduced in the late 1960s, they remain largely inaccessible in the majority of low- and middle-income countries (LMICs). The inadequate availability of microsurgical training facilities and medical professionals trained in microneurosurgical techniques is a key factor contributing to the disparity in LMICs when compared to high-income countries.

**Methods:** To bridge this divide, in 2020, we began procuring stereo microscopes, microsurgery training instruments, and materials from various online auction websites and other sources. All the purchases and quality checks were made by the first author, AK, and MMI members. After the quality check, we donated different microscopes and instrument setups to neurosurgeons from LMICs based on individual needs. After delivering the setup to the intended locations, we provided previously recorded training videos and organized online lectures. Additionally, we have visited some of the centers and organized in-person microanastomosis training courses in those countries.

**Results:** To date, we have reached out to 17 LMICs and 26 centers and donated 50 stereo microscopes and macro/micro instrument sets. We arranged virtual meetings with many of those centers to introduce the equipment we provided and offer guidance on utilizing our pre-recorded training videos to initiate microsurgery practice in their institutions. In addition, we organized microsurgical training "boot camps" in seven locations with over 100 trainees from four countries: Turkey, Georgia, Azerbaijan, and Paraguay.

**Conclusions:** Free, accessible, and sustainable microsurgical training for LMICs is feasible and MMI will further continue to contribute to microvascular laboratory training in LMICs.

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## Global Neurosurgery

ePoster presentation

Low-cost high-quality surgical training microscope: an innovative solution for LMICs

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**Objectives:** In this study, we aimed to construct a low-cost high-quality surgical training microscope, evaluate its effectiveness to meet specific training needs, and promote accessibility and affordability by providing do-it-yourself guidelines, enabling broader usage of similar microscopes in LMICs.

**Background:** Microneurosurgery requires intensive training in surgical neuroanatomy and microsurgical techniques. Therefore, long hours of laboratory training are of utmost importance to improve manual dexterity, hand-eye coordination under microscopical magnification, and 3-dimensional surgical neuroanatomy knowledge. Such laboratories are often thought to require high-cost microscopes and instruments which are not available in most of the low-resource countries. Here we have constructed a low-cost high-quality surgical microscope to adopt in microneurosurgery training laboratories in LMICs.

**Methods:** In order to utilize any kind of microscope for microneurosurgical laboratory training, it should meet certain criteria such as stereoscopic vision, magnification, working distance, and illumination.

An old high-quality ophthalmic microscope part(\$76) and an external LED ring light source(\$25) were purchased online. Simultaneously, a high-quality used monitor arm(\$50) was purchased at a local furniture store. Additionally, binocular tubes with eyepieces were purchased online for \$20.

The ophthalmic microscope's component, consisting of a true stereoscopic magnification lens system and eyepiece, was detached and affixed to the monitor arm using its intermediate attachment component.

**Results:** The complete setup was attached to a station in Lincoln F. Ramirez Neurosurgery Operative Skill Laboratory and tested with cadaveric specimens. Our innovative solution offers true stereoscopic vision, appropriate magnification options(6-10-16-25-40-fold), adjustable working distance(200mm), and ample illumination to ensure optimal performance in training settings.

**Conclusions:** We have shown that a low-cost high-quality microsurgery training microscope can be constructed and used effectively in laboratory settings. According to our experience, after enough training, it can be used easily in OR setting for other microsurgical disciplines, such as ENT, Ophthalmology, Plastic and Reconstructive Surgery, and Vascular Surgery.

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## Spine

ePoster presentation

### Giant schwannoma of the thoracic spine: case report and review of the literature

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#### **Objectives:**

Report a case of a giant schwannoma of the thoracic spine and review the current literature.

#### **Background:**

Giant schwannomas of the thoracic spine refer to schwannomas spanning more than two vertebral bodies or having extraspinal extension of more than 2,5cm. These lesions can pose a major surgical challenge due to their large size and involvement of critical anatomical structures. We report a case of a 9cm x 8cm x 7cm schwannoma arising from the left second thoracic nerve root.

#### **Methods:** Case report.

Review all published articles and case series on electronic journal databases.

#### **Results:**

The case involves a 54 year old female who presented with a progressive history of shortness of breath. On magnetic resonance imaging of the chest she was found to have a lobulated extradural mass originating from the left second thoracic nerve root which measured 9cm x 8cm x 7cm. Gross total resection of the lesion was performed via a posterolateral approach. Post-operatively the patient was noted to have parasthesia in the left axilla which resolved by the 6 week follow up along with her shortness of breath.

Due to the rare nature of giant schwannomas of the thoracic spine there has only been one case series with only a few case reports published to our knowledge. The literature shows a predilection for females with the mean age being in the fourth decade. There was an even distribution regarding thoracic vertebral origin. The mean volume was 91cm<sup>3</sup> with our case surpassing that with a volume of 252cm<sup>3</sup>. Interestingly we found that there was a wide range of approaches used, even in the case series involving a single surgeon. The most common complications were post-operative lower respiratory tract infections as well as surgical site infections.

**Conclusions:** The large variability in surgical approaches used highlights the paucity of surgical guidelines.

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## Spine

ePoster presentation

### Fully endoscopic spine separation surgery in metastatic disease

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**Objectives:** This report aims to describe the surgical methodology and potential effectiveness of endoscopic separation surgery (ESS) in patients with metastatic spine disease. This concept may reduce the invasiveness of the procedure, which can potentially speed up the wound healing process and, thus, the possibility of faster application of radiotherapy.

**Background:** Spinal endoscopy has rapidly developed in recent years. With the introduction of new tools and highly effective coagulation, the list of indications for this technique is constantly expanding. Therefore, in this study, we utilized a novel method to visualize the separation procedure in patients with metastatic lesions in the spine.

**Methods:** In this study, separation surgery for preparing patients for stereotactic body radiotherapy (SBRT) was performed with fully endoscopic spine surgery (FESS) followed by percutaneous screw fixation (PSF).

**Results:** Three patients with metastatic spine disease in the thoracic spine were treated with fully endoscopic spine separation surgery. The first case resulted in the progression of paresis symptoms that resulted in disqualification from further oncological treatment. The remaining two patients achieved satisfactory clinical and radiological effects and were referred for additional radiotherapy.

**Conclusions:** With advancements in medical technology, such as endoscopic visualization, and new tools for coagulation, we can treat more and more spine diseases. Until now, spine metastasis was not an indication for the use of endoscopy. This method is very technically challenging and risky, especially at such an early stage of application, due to variations in the patient's condition, morphological diversity, and the nature of metastatic lesions in the spine. Further trials are needed to determine whether this new approach to treating patients with spine metastases is a promising breakthrough or a dead end.

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## Paediatric

Oral presentation

Rate of adverse events in a pediatric neurosurgical practice over 4 years

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**Objectives:** To determine the true rate of all post-surgical Adverse Events (AE) in a Pediatric Neurosurgical Practice.

**Background:** The rate of AE's in Pediatric Neurosurgery is reported to be between 20-30%. The rate of AE in the Pediatric Neurosurgery Service (PNS) at Johns Hopkins All Children's Hospital (JHACH) was found to be 20-22% in a limited audit in 2019. To determine a true AE rate, improve our outcomes, and proactively identify problems, we catalogued all neurosurgical procedures and all AE experienced after surgery.

**Methods:** 1600 neurosurgery procedures performed at JHACH from Dec2019-Apr2023 were entered into a database and analyzed for AE sustained during 30-day post-operative period (90-day for shunt infections).

**Results:** The overall rate of AE was 9.2% over the study period. Broken down by year, the rate of AE was 11.2% (FY'20), 8.5% (FY'21), 8.3% (FY'22), and 9.5% (FY'23). The rate of Infections, Readmissions, Unplanned Return to the OR, and Mortality was 1.8%, 5.2%, 6.5%, and 0.3% respectively. The highest rate of AE was related to Shunt procedures. Shunts accounted for 29.7% of all cases and the rate of AE was 17.9%, with RTOR and Readmissions accounting for most of them (15.1% and 10.3% respectively). Craniotomy for Tumor and Laminectomy for Spina Bifida had AE rates of 11.1% and 8.8%. The first year of the Covid pandemic saw a significant decrease in the number of cases with an increase in the rate of AE's (11.2%), and infections (3.4%). AE were slightly higher for African Americans and Spanish-speakers.

**Conclusions:** The overall rate of AE at JHACH is lower than previously determined, and lower than reports in the literature. Shunts constitute the highest number of procedures and have the highest rate of AE. Determining a historical baseline for AE will allow the establishment of quality metrics.

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## Spine

Oral presentation

Outpatient spine surgery: clinical effectiveness, safety and complication rates in Polish ambulatory center

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**Objectives:** The purpose of this study was to evaluate the safety and effectiveness of endoscopic techniques in ambulatory spine surgery and to compare the outcomes of different endoscopic procedures.

**Background:** In countries with a liberal, free-market health care model, such as the United States or Korea, more and more surgical procedures are performed in an outpatient manner. In the authors' opinion, the Polish health system is so conservative that its rules even stimulate healthcare entities to waste public funds on artificially prolonged hospitalization times, in order to be reimbursed.

**Methods:** We conducted a retrospective analysis of 318 patients who underwent ambulatory spine surgery at our center between 2018 and 2021. The procedures performed included endoscopic discectomy (PELD), microdiscectomy (MLD), anterior cervical discectomy with fusion (ACDF), endoscopic interbody fusion with percutaneous screw fixation (endoLIF), endoscopic posterior lumbar fusion (endoPLF), interlaminar endoscopic system (ILESSYS), and transforaminal endoscopic spinal system (TESSYS). The patient data was collected and analyzed for preoperative visual analog scale (VAS) scores, VAS scores one week after surgery, and VAS scores declared six months after surgery.

**Results:** Our results showed that endoscopic techniques in ambulatory spine surgery were safe and effective, with a low complication risk of 2.83%. The procedures had a significant impact on reducing patient pain, with all procedures showing significant improvements in VAS scores one month after surgery compared to preoperative scores. Additionally, there were significant improvements in COMI scores twelve months after surgery in all procedures.

**Conclusions:** Our study provides evidence supporting the use of endoscopic techniques in ambulatory spine surgery, with favorable outcomes and low complication rates. The choice of procedure should be individualized and based on patient characteristics, clinical indication, and the surgeon's experience. Our results suggest that PELD, ACDF, and MLD are effective and safe options for ambulatory spine surgery, with high success rates.



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## Education, Ethics, Socioeconomic

Oral presentation

Cost-utility analysis of outpatient lumbar microdiscectomy: a comparative assessment of hospitalization costs and clinical outcomes

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**Objectives:** This study aims to assess the cost-utility of transitioning lumbar microdiscectomy (MLD) from inpatient to outpatient settings within the context of the Polish healthcare system.

**Background:** Lumbar microdiscectomy (MLD) is a widely performed surgical procedure for spinal conditions and has been increasingly adopted as a one-day surgery due to its technical simplicity and low complication rate. However, the economic impact of transitioning MLD from inpatient to outpatient settings has not been assessed in Poland, leaving uncertainties regarding the actual burden of spine care.

**Methods:** This study aims to evaluate the cost-utility of outpatient MLD compared to the traditional inpatient procedure, taking into consideration the determinants of the Polish healthcare system. To conduct the cost-utility analysis, direct medical costs were examined based on data obtained from 25 patients who underwent outpatient lumbar microdiscectomy at a private ambulatory spine center, and 25 patients who underwent inpatient lumbar microdiscectomy at a Polish National Health Service (NHS) hospital.

**Results:** The results indicated that transitioning MLD to an outpatient procedure can result in substantial cost savings of approximately 55% compared to inpatient procedure costs. Efficacy outcomes were similar in both groups. Notably, no cases of readmission within 30 days were recorded in either group. The average admission time for the inpatient group was 3.5 days. Interestingly, the outpatient approach remained cost-effective even when a reduction in inpatient admission time was considered.

**Conclusions:** This research, the first economic evaluation of its kind in Poland, demonstrated that transitioning MLD to an outpatient setting can lead to a significant reduction in costs while maintaining similar clinical outcomes. These findings strongly advocate for the cost-effectiveness of outpatient MLD, suggesting that this transition should be considered for coverage by national health insurance systems.

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## Oncology

ePoster presentation

Tumor to meningioma metastasis as an index presentation of metastatic prostate cancer in a 53-year-old male

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**Objectives:** To describe an unusual case of prostate to meningioma metastasis.

**Background:** Nearly a century since its description tumour to meningioma metastasis (TTMM) remains uncommon with prostate to meningioma metastasis being even more sporadic. There are currently ten documented cases, one being the index presentation of an occult prostate cancer. This case report presents the second patient with TTMM as the initial presentation of prostate cancer.

**Methods:** This patient had a Simpson grade III resection of a sphenoid wing meningioma.

The study further discusses the location as well as the period of TTMM diagnosis

**Results:** Immunohistochemistry favored a primary prostatic cancer.

The location of prostate to meningioma metastasis has been consistent with the usual locations of meningioma.

**Conclusions:** Prostate to meningioma metastasis remains a rare presentation. Location is consistent with the usual sites for meningioma occurrences.

## Endovascular Neurosurgery

ePoster presentation

Ipsilateral internal carotid agenesis and ruptured cerebral aneurysm: an unusual association with therapeutic challenges

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**Objectives:** The absence of the common carotid artery (CCA) and the internal carotid artery (ICA) is a rare vascular anomaly, with few cases reported in the literature. It is usually discovered incidentally due to the absence of symptoms. This report describes a rare case of ipsilateral ICA agenesis associated with a ruptured cerebral aneurysm.

**Background:** ACC and ICA agenesis leads to an increase from 2-4% to 25-34% in the occurrence of intracranial aneurysms. Aneurysm formation in these cases may be a consequence of hemodynamic disturbances caused by dysgenesis, causing flow stress to the contralateral arteries. Proximity to relatively complex anatomical structures and variations, in addition to the vascular disorders caused by agenesis, increase the risk factors for clipping surgery, making the procedure much more delicate.

**Methods:** A 35-year-old male patient sought medical attention complaining of a sudden severe headache in recent weeks, unresponsive to medication. Angio Tomography of the Skull exam identified a lobulated saccular aneurysm measuring 1.1 cm in the largest diameter located in the Anterior Communicating Artery (ACOM). In addition, the neuroimaging exam accidentally revealed another very significant finding, the patient does not have the common and internal carotid artery on the right side, with occlusion close to its origin.

**Results:** Microsurgery for clipping the aneurysm was indicated, craniotomy with pterional access to the left and clipping of the aneurysm uneventfully during the procedure. In the outpatient follow-up, the patient did not present any deficit or neurological alteration, maintains regular follow-up, and denies headache or any other associated symptom in the postoperative period.

**Conclusions:** The absence of the CCA and ICA is extremely rare, making events like this truly peculiar. ICA agenesis usually does not cause symptoms, but it increases the occurrence of aneurysms, which can cause varied symptoms, depending on their severity, growth, location, and rupture.

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## Paediatric

Oral presentation

### Supraorbital craniotomy for resection of brain tumors in children

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**Objectives:** Understand the indications for the supraorbital keyhole craniotomy for resection of lesions in children.

**Background:** Supraorbital craniotomy is a common approach for intracranial lesions in adults, whereas it is less commonly utilized in pediatric patients.

**Methods:** The authors describe their experience with the supraorbital craniotomy, a keyhole approach for intracranial lesions in children. This retrospective analysis shares the experience in 63 children with a variety of lesions (trauma, neoplasm, vascular, congenital). The approach utilized was a supraorbital craniotomy for all children.

**Results:** There were no complications in all cases. The goal achieved biopsy, resection, or removal for all cases. Parents were satisfied with the cosmetic appearance in 62/63 children. There were no return to the operating room, infection or CSF leak. The average hospital stay was 2.3 days (range 1-4 days). Postoperative imaging did not demonstrate any retraction injury or ischemia to the frontal lobes.

**Conclusions:** The supraorbital craniotomy is a reasonable minimally invasive approach for intracranial lesions in children. The craniotomy is well tolerated and provides adequate access for a variety of etiologies in children.

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## Oncology

ePoster presentation

### Profile of intracranial meningioma

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**Objectives:** The authors analyzed the profile of intracranial meningioma treated at Neurosurgery Division of Arifin Achmad Regional General Hospital Riau Province Indonesia between 2016 and 2019.

**Background:** Meningioma is a primary extra axial brain tumor that occurs outside the brain parenchymal tissue, originate from arachnoid cap cells. They are mostly benign tumors that can be operated with gross total resection that provides good outcomes.

**Methods:** This study included patients who underwent intracranial meningioma surgery. These patients were profiled for epidemiological, histopathological and underwent outcome assessment at the time of hospital discharge.

**Results:** We operated 87 patients who were diagnosed intracranial meningioma since January 2016 until December 2019. The results showed that most of the patients were aged 40-49 years (48,3%), predominantly female (89,7%) and had a history of hormonal contraceptive (75%). Headache was reported as the most frequent clinical symptom (75,9%). The sphenoid wing area was the most common location (33,3%). Based on the WHO Classification we found benign meningioma WHO grade I (88,5%) with dominantly meningothelial meningioma type (55,2%). The length of stay of meningioma patients in one treatment period was more than 7 days (63,2%). The outcome was generally good in most patient (90%).

**Conclusions:** Meningioma was the most common benign intracranial brain tumor. We found that our results were consistent which had been reported. We are aware that this study needs to be continued. Our highlight is that hormonal contraceptive has certain role in patients with meningioma that should be studied further.

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## Trauma

ePoster presentation

### Early surgery and high dose steroids in treating patients with indirect traumatic optic neuropathy: a meta-analysis and systematic review

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**Objectives:** In this study, we compared whether immediate management with surgical decompression alone or steroids alone would lead to improvement of visual outcomes in individuals with indirect traumatic optic neuropathy. We also compared outcomes and complications between transcranial and endoscopic surgery.

**Background:** Optic nerve injury is a devastating cause of permanent visual loss after blunt or penetrating injury occurring in up to 7% of head trauma cases. While numerous therapeutic protocols exist, no single treatment strategy and timing of intervention has proved optimal. Timely and appropriate management is key to improving visual outcomes.

**Methods:** We searched from the Cochrane Central Register of Controlled Trials in the Cochrane Library, MEDLINE/PubMed, the US National Institutes of Health Ongoing Trials Register, Embase database, Health Research and Development Information Network (HERDIN), and the World Health Organization International Clinical Trials Registry Platform for studies to be included. Patients with direct Optic nerve injury, those who received combined treatment with surgery and steroids, and those with delayed initiation of treatment were excluded. Outcome evaluated was improvement in visual acuity. The risk of bias was assessed using the ROBINS-I tool for nonrandomized studies.

**Results:** The final search yielded five eligible studies included in the meta-analysis. Both early surgical decompression and high dose steroids did not show any statistically significant difference in improvement of visual function with homogenous results among the included studies. (RR 2.35, 95% CI 0.87 to 6.34, p=0.09, I<sup>2</sup> 0%). Among patients who underwent early surgical decompression, the rate of visual acuity improvement was 73% with those who underwent transcranial surgery and 69% with those who underwent endoscopic surgery.

**Conclusions:** This meta-analysis and review shows that immediate surgical decompression and early high dose steroid administration are equally effective in improving visual function. Higher rate of visual improvement was noted with transcranial surgery than endoscopic surgery.

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## Paediatric

ePoster presentation

3 in 1: a rare combination of split cord malformation type II, dermoid cyst, and fatty filum terminale in a 12 yo female

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**Objectives:** To present a case of Split Cord Malformation Type II, Dermoid Cyst, and Fatty Filum Terminale in a 12 year old female

**Background:** Split cord malformations are rare congenital anomalies involving duplication of the spinal cord. They are often associated with other spinal lesions such as tethered cord, kyphoscoliosis and syringomyelia, and should be treated urgently to prevent neurologic and urologic complications.

**Methods:** We report a case of a 12-year-old with multiple spinal congenital abnormalities managed surgically.

**Results:** A 12 year old female presented at our outpatient department due to purulent discharge at her lower back associated with urinary incontinence, difficulty in bowel movement, and unsteady gait. Since birth, she already presented with urinary incontinence and bowel disturbance. 5 months prior to initial consult, she had purulent discharge at her back. Whole spine MRI showed a SCM type I at T12-L1 level with a dermoid cyst at L3- L4 level and a fatty filum terminale with tethering at L5.

She came in GCS 15 with a tuft of hair at the lumbosacral area and a cutaneous fistulous tract. Motor and sensory examinations were normal, with brisk reflexes. She underwent excision of the dermoid cyst and cord detethering with T12-L5 laminoplasty. Intraoperatively, the cyst was well circumscribed, containing waxy and sebaceous material with hair. The cyst was subtotally removed, intentionally leaving a small residual that was adherent to the cauda equina. The filum terminale was also sectioned to detether the cord. Postoperatively, she did not develop any new neurologic deficits but her urinary incontinence remained.

**Conclusions:** Treatment of these patients should be individualised and performed soon after birth to preserve function. We sought to present our experience with a unique case of an untreated split cord malformation in an adolescent; for this patient, we performed a multilevel exposure in order to address three pathologies in a single operation with laminoplasty to maintain stability.

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## Spine

ePoster presentation

Our experience of surgical treatment of failed back surgery syndrome with osteochondrosis of the lumbar division

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**Objectives:** Determination of the optimal methods of surgical treatment of failed back surgery syndrome of the lumbar division after discectomy.

**Background:** First described by North et al. in 1991, failed back surgery syndrome (FBSS) is a term that groups the conditions with recurring low back pain after spine surgery with or without a radicular component. This is in fact a misnomer because the clinical presentation may be caused due to a mismatch between the patient's and surgeon's expectations prior to the surgery.

**Methods:** The study included 36 patients operated on relapses of pain syndromes. Repeated surgical interventions were decompressive and decompressive-stabilizing with posterior interbody spondylodesis with cage and transpedicular systems. The results of the treatment of relapses were studied in the period from 6 to 48 months.

**Results:** The main cause of recurrent pain syndromes were recurrent hernias of operated disk (52,8 %) and their combinations with degenerative stenosis (9.7 per cent). In isolated type the degenerative stenosis was the cause of relapse (21,6 %). Hernia relapses of operated disk more often were the cause of the pain syndrome in the first two years after surgery. Degenerative stenosis, both in isolated type and also in combination with the hernia of operated disk, often took place at a later date. Pathomorphological substrate of stenosis were hypertrophied articular process, the pedicles of the vertebrae, osteophytes, thick, yellow ligament, epidural fibrosis. Fibrotic changes were identified intraoperatively in all cases. The treatment outcomes were better in patients who were performed decompressive-stabilizing operations. The repeated relapses of pain after performing decompressive operations occurred in 9.8% of cases, and after decompressive-stabilizing – in 1.4 %.

**Conclusions:** Decompressive-stabilizing operations with performing posterior interbody fusion are optimal and technically adequate form of surgical treatment of recurrent pain syndrome after removal of herniated lumbar intervertebral disks.



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## Spine

ePoster presentation

### Percutaneous surgical treatment of myelomas involvement of the spine

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**Objectives:** To analyze the efficacy of contemporary decompressive-and-stabilizing techniques, including percutaneous vertebroplasty, in patients with a spine myelomatosis.

**Background:** multiple myeloma (MM) is a malignant monoclonal proliferation of plasma cells. MM accounts for approximately 1% of all malignant tumors and 10% of all hematological tumors. Of the primary malignant tumors, myeloma, along with lymphoma, most often affects the spine. Every year, 4-5 people out of 100,000 develop MM.

**Methods:** Forty-two patients with SM were evaluated with respect to the results of treatment. Forty-two patients underwent surgical interventions followed by radiotherapy and chemotherapy, all patients was operated percutaneous vertebroplasty (PVP). Pain regression, neurologic state and quality of life were evaluated after surgery.

**Results:** Radiotherapy and chemotherapy are the methods of choice for SM. However in some cases with increasing neurologic deficit, intractable pains and instability of an involved spine segment a surgical intervention is necessary and capable to prevent catastrophic complications. Best results, regarding neurologic impairments and quality of life, were achieved in a group of patients in whom percutaneous vertebroplasty procedures were performed.

**Conclusions:** PVP is a minimally invasive procedure ensuring quick regression of a pain syndrome and prevention of pathologic fractures in patients with myelomatosis of the spine.

Key Words: myelomatosis, multiple myeloma, neurologic state, percutaneous vertebroplasty.

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## Spine

ePoster presentation

Our experiment is surgical treatment of nonspecific spondylitis with the use of osteoinductive materials and stabilizing systems of the lumbar spine

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**Objectives:** To improve the results of surgical treatment of nonspecific spinal spondylitis of the lumbar spine with the use of osteoinductive materials and the use of TPF systems.

**Background:** The urgency of the problem of treatment of nonspecific osteomyelitis of the spine is explained by the increase in the frequency of this type of pathology over the past decades, the emergence of new clinical forms of infectious lesions of the spine, new antibiotic-resistant strains of microorganisms, as well as the severity of the course and high rates of unsatisfactory anatomical and functional outcomes.

**Methods:** The material of our work consisted of 23 patients operated for nonspecific spinal spondylitis of the lumbar spine. There were 10 (43.4%) women and 13 (56.4%) men in the material. The average age of patients was 38.2±2.4 years. Indications for surgical treatment were the presence of pain syndrome, conduction and segmental disorders and the presence of bone destruction of vertebral bodies. Nonspecific spinal spondylitis of the lumbar spine occurred in all 23 patients.

**Results:** Clinical result in patients after surgery, one patient had reflex pain, which was stopped with muscle relaxants, 9 patients had moderate pain (the patient periodically took painkillers), the rest of the pain passed and the patients returned to an active lifestyle. Results in the postoperative period: 16 (69.5%) patients had good results, 6 (26.1%) patients had satisfactory results and 1 (4.4%) patient had unsatisfactory results (reflex pain was noted).

**Conclusions:** Corporectomy with the rehabilitation of the inflammatory focus and fusion of the MESH (filled with bone graft) and stabilization of the TPF system (multi-axis screws) allows you to diversify the position of the screws. This feature minimizes the need for contouring of the rod, reduces metal fatigue, reduces operating time, makes it possible to thoroughly sanitize the inflammatory focus and early activation of patients.

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## Spine

ePoster presentation

### Posterior interbody fusion of the lumbosacral spine - PLIF

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**Objectives:** To assess the reliability of the method of posterior stabilization with interbody titanium cages in degenerative diseases of the lower lumbar spine

**Background:** Diseases of the lumbar spine, primarily deformities and degenerative lesions, are an important medical problem. Spinal fusion is one of the methods of surgical treatment of this pathology. Posterior interbody fusion in combination with transpedicular fixation is an alternative method to anterior and most commonly used posterior fusion.

**Methods:** In 2018-2022, 36 patients (20 women and 16 men) aged 32 to 71 years (average age 44.9 years) were operated on. The follow-up period ranged from 6 to 12 months. The surgical operation for pre- and postoperative grade I-II spondylolisthesis and stenosis consisted in extensive decompression of the posterior structures of the spinal canal by laminectomy with partial or complete bilateral facetectomy and posterior interbody stabilization with titanium cages. In case of instability, recurrent and primary disc herniation, the operation was limited to partial resection of adjacent arches with removal of the lower articular processes of the overlying vertebra.

**Results:** The technique of posterior interbody fusion of the lumbar spine (PLIF) makes possible complete decompression of nerve formations inside the spinal canal, while providing sufficient stability of the spine. Nerve roots are released due to decompression (laminectomy, fenestration, facetectomy). The interbody implant retains and preserves the original height of the interbody gap, as well as the normal anatomical relationships between nerve and bone structures (the radicular intervertebral foramen), creating good conditions for arthrodesis.

**Conclusions:** Based on the results obtained by us, it can be argued that the titanium implant is a safe material.

A preliminary analysis of the initially obtained treatment results in 33 (73.3%) patients with excellent and good results requires recognizing the PLIF technique as necessary and safe in the treatment of pain syndromes of the lumbosacral spine.

## Oncology

ePoster presentation

### APOL1 in pan-cancer, and its relationship to proliferation and metastasis in glioma: a prognostic and immunotherapeutic study

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**Objectives:** APOL1 play an important role in tumorigenesis. However, no studies have comprehensively analyzed the diagnosis, prognosis and immune function of APOL1 in pan-cancer.

**Background:** Apolipoprotein L1 (APOL1) is a secretory high-density lipoprotein (HDL) that can bind to apolipoprotein A1 (APOA1) and participate in lipid transport and metabolism. APOL1 is expressed in a variety of malignancies and is strictly connected to the survival and prognosis of patients.

**Methods:** APOL1 was systematically investigated for its potential role in tumor prognosis and immune function. Based on publicly available databases such as TCGA, GTEx, UCSC Xena, cBioPortal, and ImmuCellAI, we revealed potential links between APOL1 and survival outcomes. Additionally, we explored the role of APOL1, including its correlation with DNA methylation, TME, immune cell infiltration in tumors. Finally, the malignant phenotype changes of glioma U251 cell line after APOL1 knockdown were investigated by lentivirus gene interference technology.

**Results:** The results showed APOL1 was expressed at high levels in many tumor tissues. Of note, elevated APOL1 expression was significantly associated with poor prognosis in many tumor types. In addition, DNA methylation and tumor microenvironment had been shown to be significantly correlated with APOL1 expression in a variety of tumors. The expression of APOL1 was positively correlated with Tc cells, Th1 cells, iTreg cells and Tfh cells, and negatively correlated with neutrophil and CD8+ naive cells. Moreover, APOL1 coexpressed with genes that encode immune activators, suppressors, chemokines, and receptors for chemokines. There was a strong correlation between APOL1 expression and immunological processes, as shown by biological enrichment analysis. Further cell level experiments showed that knockdown of APOL1 could inhibit the proliferation, migration and invasion of glioma U251 cells.

**Conclusions:** Due to its role in tumor immunity and tumorigenesis, APOL1 may be a promising prognostic marker and immunotherapeutic target.

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## Oncology

Oral presentation

### Multimodal predictive model for temozolomide resistance in glioblastoma

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**Objectives:** Elucidating the mechanisms of drug resistance and identifying biomarkers associated with resistance can facilitate the development of personalized treatment strategies and therapeutic targets.

**Background:** Temozolomide (TMZ) is a first-line chemotherapy drug for glioblastoma (GBM), and its clinical utility is limited by severe drug resistance.

**Methods:** TMZ resistance GBM cell chip sequencing data sets (GSE100736 and GSE113510) were downloaded from GEO database. After difference analysis, intersection genes were selected and defined as TMZ resistance related genes. TCGA-GBM and GSE83300 were downloaded to analyze the expression and prognostic value of TMZ resistance related genes, then Lasso regression analysis was performed to construct a model for predicting patient survival. Patients were divided into two groups of high and low risk. INHBB was selected as the key regulator. TMZ-resistant and sensitive U251 cell lines were cultured, lentiviral transfection technology was used to knock down the expression of INHBB in U251 cells, and the IC50 changes of TMZ in two groups were detected. Transcriptome identified the possible signaling pathway changes.

**Results:** A total of 276 TMZ resistance related genes were obtained. Based on five model genes (SERPINA5, SPP1, INHBB, RGS4, LBH), the model was constructed. Among patients treated with TMZ, the high-risk group had worse survival, while among patients not treated with TMZ, there was no difference in survival between two groups. In addition, the low-risk group was found to be more sensitive to immunotherapy. The expression of INHBB was higher in TMZ-resistant U251 cell line, and the cells were more sensitive to TMZ after the expression of INHBB was knocked down. Transcriptome sequencing suggested that INHBB may promote the development of chemotherapy resistance through the formation of neutrophilic extranuclear traps.

**Conclusions:** We constructed a predictive model of GBM susceptibility to TMZ and verified the role of INHBB, which is expected to be developed as an effective therapeutic target.

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## Neurovascular Surgery

Oral presentation

### Natural course of ruptured but untreated intracranial aneurysms: a multicenter 2-year follow-up study

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**Objectives:** To understand patient prognosis of untreated ruptured intracranial aneurysms recent in China.

**Background:**

Multicenter clinical registry studies on untreated ruptured intracranial aneurysms in Chinese patients are scarce. We aimed to calculate the mortality of patients with untreated ruptured intracranial aneurysms in a current, clearly defined hospital cohort in China, with emphasis on mortality predictors over a 2-year period.

**Methods:**

Patients with saccular untreated ruptured intracranial aneurysms were identified from the CMAD, a multicenter, prospective, observational database registered in China, which involved 32 tertiary medical centers covering 4 northern China regions. Patients with intracranial aneurysms were consecutively included in 12 of 32 medical centers between 2017 and 2020. Survival probabilities were computed using the Kaplan-Meier method. Univariate and multivariate Cox regression analyses were conducted to determine the risk factors for the cumulative 2-year mortality. We analyzed the reasons for treatment decisions stratified by demographic characteristics and clinical features.

**Results:**

For 941 enrolled patients, 58.6% of patients died within 1 month of symptom onset; and 68.1% within 2 years. 98 patients underwent surgical repair during follow-up. Multivariate Cox regression analysis identified Hunt and Hess grades 3 to 5 (hazard ratio, 1.54 [95% CI, 1.01–2.35]; P=0.047), loss of consciousness at symptom onset (hazard ratio, 1.56 [95% CI, 1.18–2.07]; P=0.002), and largest aneurysm size of  $\geq 5$  mm (hazard ratio, 1.29 [95% CI, 1.05–1.59]; P=0.014) as mortality predictors during the 2-year follow-up. Among patients who were successfully followed up, 42.6% (280) of them refused surgical treatment.

**Conclusions:**

Patients with poor Hunt and Hess grades, loss of consciousness at symptom onset, or largest aneurysms  $\geq 5$  mm in size showed a high mortality rate. A high number of treatment refusals was present in this study. These findings have implications for medical insurance policy, doctor-patient communication, and popular science education.

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## Paediatric

ePoster presentation

### Management of vertebro-medullary trauma by gunshot in a child at Sikasso hospital: a case and review of the literature

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**Objectives:** We report a clinical case of verbromedullary trauma in a 10-year-old child.

**Background:** Vertebromedullary traumas are by firearm especially by gunshot are one of the main etiologies of spinal cord trauma in children in the world. In the literature, these etiologies are less reported in Africa.

**Methods:** This is a 10-year-old boy who was the victim of a gunshot with a bullet in the dorsal spine admitted for Brown Square syndrome following vertebral-medullary trauma by firearm. On admission, the patient had a Glasgow score of 15, a punctate wound of 3 mm par vertebral left 2 cm from the spines, monoplegia of the right lower limb associated with impairment of deep sensitivity. On the left and he had an abolition of thermo-algic sensitivity with a sensory level at D8.

**Results:** The dorsal CT scan performed showed intra-canal bullet shrapnel at D7-D8 level. The blood count was normal.

The patient was operated on with a D7 and D8 laminectomy and removal of 2 bullet fragments which were intra-canal and extradural on the right. We found a 4 mm wound at the level of the dura mater which was sutured. The postoperative evolution was marked by an improvement of 1/5 to 3/5 on the right. The follow-up CT showed another more anterior intradural metal fragment in the spinal cord. We decided to monitor the patient.

**Conclusions:** Vertebromedullary gunshot wounds in children are serious and cause disability and affect their quality of life in the long term. Prompt and adequate care can reduce the sequelae.

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## Paediatric

Oral presentation

Outcomes of endoscopic third ventriculostomy with or without choroid plexus cauterization in pediatric hydrocephalus management in Africa: a systematic review

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**Objectives:** To evaluate the pooled outcomes of ETV with or without CPC in management of hydrocephalus in paediatric patients in Africa.

**Background:** Endoscopic third ventriculostomy (ETV) with or without choroid plexus coagulation (CPC) is widely used as an alternative treatment in management of pediatric hydrocephalus in various Surgical Units worldwide. Numerous studies have looked at the effects of this therapy; however, the pooled results of these studies have not fully evaluated. A systematic review and meta-analysis were conducted.

**Methods:** PRISMA guidelines was used in the study. Eligible studies were identified by searching PubMed, Embase, Google Scholar, and African Journal Online repositories up to April 15th, 2023. Secondary outcomes covered were socio-demographic traits, etiology of hydrocephalus, and comorbidities. Primary outcome were ETV/ CPC success rate, which was defined as no secondary treatment needed for CSF diversion. Utilizing the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool and the Cochrane risk-of-bias tool for randomized trials (RoB 2), data was combined. Findings of a random-effect model meta-analysis were displayed as forest plots.

**Results:** A total of 22 studies with 2,422 participants were evaluated. Average age of the study participants was 6.2 months and 56.3% were boys compared to girls (n=607 vs. 472). Most prevalent type of hydrocephalus (39.4%, n=561) was post-infectious hydrocephalus. Generally, 65% of children treated with ETV with or without CPC experienced overall success. Patients treated with ETV/CPC had a higher overall success rate than those treated with ETV alone (53% vs. 70%). Most prevalent side effects following ETV/CPC intervention noted were hemorrhage (16%, n=18), infections (21%, n=24), and cerebrospinal fluid leak (25%, n=28). Mortality across all courses was 2% overall (n=49).

**Conclusions:** ETV/CPC has a higher success rate compared to ETV alone in management of pediatric hydrocephalus in Africa.



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## Spine

ePoster presentation

### Pattern of spine cases in a new neurosurgery centre in Southeast Nigeria

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**Objectives:** Our aims were to look at the pattern of spinal pathologies surgically managed in the hospital including their age and sex distribution, the pathologies and procedures performed as well as immediate post operative outcomes.

**Background:** The Imo State Specialist Hospital (IMSSH) commenced neurosurgical services in April 2021 and spine procedures in August 2021. The activities of the hospital with respect to surgical management of spine pathologies were audited.

**Methods:** The case files of all spine patients who had surgical procedures at IMSSH from August 2021 to April 2023 (21 months) were retrospectively reviewed.

**Results:** Seventy-two spine patients had surgical procedures during the study period (an average of 3 – 4 spine procedures per month). The mean age of patients was  $55.4 \pm 16.1$  years with a male-to-female ratio of 7: 5. The mean age for male patients was  $53.86 \pm 17.83$  years while that of female patients was  $57.5 \pm 13.2$  years. The peak age range at presentation was in the 7th (n=23, 31.9%) decade. The highest frequency of procedures was performed in the lumbar/lumbosacral spine (56.9%), followed by cervical spine (29.1%), and thoracic/thoracolumbar spine (13.8%). Degenerative spine diseases (69.4%) accounted for the highest number of spine cases, followed by spinal trauma (20.8%) and Spinal tumours (6.9%). Mortality in the immediate post-operative period was 6.9% (n=5).

**Conclusions:** The study showed a male preponderance for spinal surgeries among our spine patients, with most cases being of degenerative spine pathology. We hope this would be helpful in formulating policies for the growth of this new Neurosurgical Centre.

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## Education, Ethics, Socioeconomic

ePoster presentation

Neurosurgical education inequality in Andean Latin America: the quality of operative training matters

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**Objectives:** To investigate the presence of operative training inequalities and its effect in neurosurgical education in Andean Latin America.

**Background:** Excellence in neurosurgical care depends on the capacity of a country to ensure a minimum knowledge base and operative skills in their practicing neurosurgeons. Neurosurgical residency in Andean Latin America does is largely unregulated, and training is subject to individual teaching style. The geopolitical situation of Andean Latin America prioritizes neurosurgical resources to capital hospitals, fostering inequality in the national neurosurgical education system. The presence of neurosurgical training inequalities in Andean Latin America has not been reported.

**Methods:** A total of 132 neurosurgical trainees (from post-graduate year 1 to 5th year practicing neurosurgeons) from all Andean Latin American countries (capital, urban and rural hospitals) answered a web-based neurosurgical anatomy knowledge assessment and an operative experience survey. Knowledge was classified into 4 tiers of excellence (subpar, basic, advanced, connoisseur) based on their assessment score.

**Results:** Participants from capital programs logged more cranial cases in each year of residency than urban counterparts,  $p < 0.01$ . Chief residents from capital programs accumulated more supratentorial cases (average 31, SD 20 range 10-80) than their urban counterparts (average 16, SD 8.9 range 7-30)  $p < 0.03$ . Emergency craniotomies accounted for 60% of Capital and 86% of urban supratentorial cases, which had less diversity of pathologies. The number of attending neurosurgeons correlated with diversity of cases ( $r = 0.42$ ,  $p < 0.01$ ). Diversity of cases (lesions other than emergency decompressions) correlated with desired practice preferences (both subspecialty and type of hospital),  $r = 0.3$ ,  $p < 0.01$ . Operative experience correlated strongly with the tier of academic excellence (measured as neurosurgical anatomy knowledge base),  $F = 65.2$ ,  $r = 0.81$ ,  $p < 0.01$ .

**Conclusions:** There is a manifest educational inequality on number and diversity of operative training amongst neurosurgical training centers in Andean Latin America. Operative training correlated with academic excellence and career aspirations.

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## Global Neurosurgery

ePoster presentation

### Molecular epidemiology of ischemic stroke in individuals of African Ancestry

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**Objectives:** Establish what is currently known and identify knowledge gaps in research on molecular biomarkers associated with stroke in Black and African Ancestry (AA) populations. Determine the molecular epidemiology of stroke in these underrepresented populations.

**Background:** Stroke is a leading cause of death and disability that disproportionately impacts individuals of AA. The incidence and prevalence of stroke continue to rise in lower and middle-income countries, including Sub-Saharan African nations, where the 3-year fatality rate is over 80%. In the US, predominately Black neighborhoods continue experiencing high rates of stroke. Although research into molecular factors has identified promising associations aimed to measure susceptibility among AA individuals, there is limited clinical utility and a pervasive Euro-centric bias. To integrate the findings across these molecular studies, this review aims to describe the molecular epidemiology of stroke in AA populations.

**Methods:** A PubMed literature search was conducted for studies published between 2013-2023. We developed a search strategy based on PRISMA guidelines including terms specific to ischemic stroke (IS), African ancestry, and molecular biomarkers.

**Results:** Our PubMed search returned 190 articles. Most studies investigated genetic and proteomic variation associated with IS risk. Variations across multiple gene loci were identified to be associated with increased risk of IS; genes included APOL1, IL6, CDKN2A, SFXN4, and TMEM108. Studies investigating downstream processes identified associations with soluble CD14, plasma GFAP, and plasma copeptin levels and an increased risk of IS. In a study, elevated serum cardiac troponin-t was significantly associated with stroke severity (NIH Stroke Score: 12.2±5.43 versus 9.78±3.97). Another identified an inverse relationship between fetal hemoglobin and IS occurrence.

**Conclusions:** Various genomic and proteomic biomarkers are reported to be associated with IS in AA populations. Further work is required to understand the aggregating effects of multiple biomarkers and the complex interplay of inherited and acquired biomarkers with social determinants of health.

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## Education, Ethics, Socioeconomic

ePoster presentation

The assessment of the first year of the beginning of neurosurgery in Sikasso: findings and perspectives

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**Objectives:** The aim of this study is to:

Present the surgical activity report of our first year of neurosurgical practice.

Show the positive impact of access to neurosurgical care on the population of Sikasso.

Promoting the popularization of neurosurgical care in sub-Saharan Africa.

**Background:** Neurosurgical care is less popularized in sub-Saharan Africa in general because of the lack of neurosurgeons. In Mali, neurosurgery was only practiced in Bamako, the capital, and Ségou. This specialty had been practiced in Sikasso in December 2021, which was in dire need given the density of its population and the distance that separates it from the capital.

**Methods:** We operated 72 patients in 1 year.

**Results:** Location of lesions Number Percentage (%).

Skull 49 cases (68.05%) Spine 23cases (31.94%). distribution of cranial pathologies.

Head injury 34 (69.38%) Hemorrhagic stroke 3 (6.12%) Chronic subdural hematoma 3 (6.12%) Hydrocephalus 4 (8.16%)

Scalp tumor 3 (6.12%) Cranial osteitis 1 (2.04%).

Extradural empyema 1 (2.04%). Distribution of vertebromedullary pathologies.

Narrow lumbar canal 12 (52.17%), Lumbar disc herniation 3 (13.04%).

Pott's disease 3 (13.04%) Trauma vertebromedullary Cervical 2 (8.69%).

Vertebral tumor 2 (8.69%) thoracic vertebromedullary spine trauma by gunshot 1(4.34%).

We had 3 cases of postoperative infection all cured under ATB, 3 deaths and the rest of the patients have evolved very well..

**Conclusions:** The advent of neurosurgery in the Sikasso region has reduced medical evacuations to Bamako by 98%, saving lives because many seriously ill evacuees died before arriving in Bamako. It has reduced the costs of care and contributes to the emergence and socio-health development of the region in particular and the country in general. This example of Mali is valid for all the countries of sub-Saharan Africa where access to neurosurgical care is still limited to certain regions.

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## Trauma

Oral presentation

### Models to predict expansive intracranial hematomas occurrence for adult traumatic brain injury patients in Uganda

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**Objectives:** To determine the models that can be used to predict the EIH occurrence for patients with TBI in Uganda.

**Background:** A suitable, reliable and prompt surgical decision based on predictive models of expansive intracranial hematomas (EIH) is of great clinical relevance. It may provide a useful instrument to improve resource allocation in the remote setting where several challenges are common. Several predictive models have been described but there is limited information on their use in predicting EIH. Most models don't take into consideration the evolutionary nature of intracranial hemorrhage.

**Methods:** A cross sectional study was conducted among adult TBI patients with intracranial hematoma undergoing surgical evacuation during a period of 16th June 2021 to 17th December 2022. Logistic regression was used to explore the factors that significantly influence EIH, due to the dichotomy of the outcome.

**Results:** Among a total of 324 enrolled patients with intracranial hematomas, 59.3% (n=192) developed EIH resulting in a proportion of 0.59 (95% CI: 0.54 to 0.65). In the final model, age, systolic blood pressure, diastolic blood pressure, subdural hematoma (SDH), diffuse axonal injury (DAI), skull fracture, and an interactive term of skull fracture and SDH were selected. Odds of having EIH increased to 1.045 times for one increment in systolic blood pressure. Odds decreased to 0.942 times for one increment in diastolic blood pressure. Having SDH increased the odds of EIH to 6.286 times, while diffuse axonal injury increased it to 4.024 times. Given a patient has skull fracture, SDH decreased the odds of EIH to 0.0676 times. The average area under the receiver operating curve (AUC) from a five-fold cross-validation was 0.722, while the average accuracy was 64.5%.

**Conclusions:** These new models will inform policy and future interventions to predict earlier EIH occurrence and build off the effective treatment modalities for such patients.

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## Neurovascular Surgery

Oral presentation

Acute carotid thrombendarterectomy – indication, results

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**Objectives:** Role of acute carotid endarterectomy (ACEA) is not so clear from EBM point of view in comparison with elective procedure. Authors present their experience with this theme.

**Background:** -

**Methods:** Sixty nine patients were operated on in the period 2002-2022 in our institutions. Fourteen women and 55 man. Average age was 63.6 year (38-81).

Diagnosis was made in the beginning using angiography but in last years uniformly by CTA. Internal carotid occlusion was present in 61 patients and narrow ICA stenosis in 8 patients. Clinical findings: Stroke in evolution 51, CVA 14 and TIA in 4 patients. Preoperative modified Rankin score: 0-0, 1-3 pts, 2-4 pts, 3-16 pts, 4-28 pts, 5-18 pts.

**Results:** ICA recanalization has been reached in 55 patients, in 10 patients (chronic occlusion) stumpectomy was performed. One patient underwent acute EC-IC bypass after ACEA failure with good result. Another patient underwent direct M1 embolectomy (no access for interventional radiologist) again with good result. Two patient after stumpectomy underwent elective EC-IC low flow bypass.

Postoperative modified Rankin score: 0-15 pts, 1-7 pts, 2-11 pts, 3-19 pts, 4-5 pts, 5-5 pts, 6-7 pts. mRS 0-2 (good result) reached 33 patients (48%).

Improvement (mRS change 1 point or more) 45 patients, stabile state 14 pts, deterioration 3 pts and death in 7 pts.

**Conclusions:** Prognosis for the patients with carotid occlusion followed by major stroke is bad. ACEA (sometimes in combination with other procedures) brings good result for large group of patients.

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## Paediatric

Oral presentation

### Use of Piezoelectric for osteotomy in craniosynostosis – a single centre experience

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**Objectives:** The goal of this study is used to evaluate merit and demerit of Piezoelectric over drill for osteotomy.

**Background:** Craniosynostosis is a congenital malformation resulting in various degree of cranial and craniofacial deformities due to premature closure of one or more cranial suture. Previously osteotomy for deformity correction was performed using drill which resulted in excessive bone and blood loss resulting in need of developing newer modality, Piezoelectric to overcome this problem.

**Methods:** Retrospectively data was collected for last 10 years of patient operated for craniosynostosis at our center and divided into two groups based on equipment used for osteotomy during surgery.

**Results:** Total of 16 patients were operated in last 10 years. In initial 10 patients (Group A) Medtronic high speed drill was used and subsequently after 2021, Piezoelectric was used in 6 cases (Group B). Average age at time of surgery in group A and B were 20.7 and 13.5 months respectively. Average duration of stay in hospital in group A and B were 7 and 8.83 days respectively. We had dural tear in 2 patients of group A and none in group B. Blood and bone loss was much less in group B patients.

**Conclusions:** Piezoelectric is a new advancement in field of osteotomy in craniosynostosis that can be used for performing bone cutting with precision with minimal bone loss and avoiding dural tear.

1280

## Spine

ePoster presentation

### L1-L2 disc herniations: clinicals characteristics and surgical results

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**Objectives:** The aim of this study was to evaluate the clinical features and surgical outcomes of upper lumbar disc herniations.

**Background:** Among upper disc herniations, L1-L2 are especially rare. The aim of this study was to evaluate the clinical features and surgical outcomes of upper lumbar disc herniations.

**Methods:** We retrospectively reviewed the clinical features of 41 patients who had undergone surgery for single disc herniations at the L1-L2 level from 2007 to 2022. Twelve patients who underwent surgery for isolated disc herniations were included. Presenting symptoms and signs, patient characteristics, radiologic findings, operative methods, and surgical outcomes were investigated.

**Results:** The mean age of patients with upper lumbar disc was 45.5 years (ranged 31 to 68). The mean follow-up period was 12.6 months. Most patients complained of back and buttock pain (08 patients), and radiating pain in areas such as the anterior or anterolateral aspect of the thigh (04 patients). Weakness of lower extremities was observed in 07 patients and sensory disturbance was presented in 05 patients. Only 2 patients (14%) had undergone previous lumbar disc surgery. Discectomy was performed using two methods : unilateral laminectomy in 10 cases, bilateral laminectomy in 2 cases. With regard to surgical outcomes, preoperative symptoms improved significantly in 08 patients, partially in 3 patients, and were aggravated in 1 patient.

**Conclusions:** Clinical features of disc herniations at the L1-L2 level were variable, and localized sensory change or pain was rarely demonstrated. In most cases, the discectomy was performed successfully by conventional posterior laminectomy. On the other hand, in large central broad based disc herniation, when the neural elements are severely compromised, the posterior transdural approach could be an alternative.



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## Oncology

ePoster presentation

Primary Ewing's Sarcoma of the occipital bone: a case report and review of the literature

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**Objectives:** To highlight an uncommon case of ewing sarcoma in the skull.

**Background:** Primary Ewing's Sarcoma (EWS) arising from cranial bones is extremely rare. It accounts for only 1 % - 4 % of all EWS.

Case description: A 21 – year- old women with EWS of the skull involving the occipital region. She underwent surgical excision following radiation therapy and chemotherapy. No recurrence or metastasis occurred during a follow-up of ten months.

**Methods:** Case report.

**Results:** None.

**Conclusions:** Ewing's sarcoma of the cranial vault is an extremely rare entity but should be considered when a youngest patient presents with suggestive clinico-radiological findings.

1282

## Global Neurosurgery

Oral presentation

Prioritizing nursing engagement in the development of global neurosurgery

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**Objectives:** - Describe the central role and opportunities for nursing engagement in the development of neurosurgical services across the globe

- Detail the barriers to nursing contributions at UCSF to global initiatives & partnerships

- Outline strategies to support nurses' participation in global initiatives & partnerships

**Background:** The development of neurosurgical services across the globe is not possible without the inclusion of nursing support and development. Still, nurses continue to be underrepresented in surgical initiatives and academic partnerships between high-income countries and low- to middle-income countries. At the University of California San Francisco (UCSF), nurses harness a strong clinical and academic skill set, as well as an interest in participating in global initiatives, but are not engaged in global neurosurgical work.

**Methods:** A survey was distributed to all nurses and advanced practice providers (APPs) at UCSF Medical Centers via email on the Qualtrics platform. A modified Dillman methodology was used, and a reminder email was sent one and two weeks following the initial survey distribution.

**Results:** 122 nurses from the fields of neurosciences, critical and perioperative care responded to the survey. 98% of these nurses were interested in being a part of global initiatives and cited the top three barriers as the cost associated with travel (75%), challenges taking time away from work (88%), and no clear pathway to engaging in global work in their field of expertise (66%).

**Conclusions:** Nursing contributions in capacity building and program development are essential in the development and expansion of global neurosurgical services. Academic medical centers and global teams must address barriers to including nursing to optimize surgical outcomes and operative services. UCSF has founded the Center for Global Nursing at the Institute of Global Health Sciences to support the role of nursing in global health initiatives, including the field of neurosurgery.

1283

## Spine

ePoster presentation

Spinal cord compression caused by a brown tumor secondary to primary hyperparathyroidism

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**Objectives:** None.

**Background:** Brown tumors (BTs) are rare non-neoplastic lesions that arise secondary to hyperparathyroidism largely involving mandible, ribs, pelvis, and large bones. Spinal involvement is extremely rare and may result in cord compression.

Case Description: A 72-year-old female with the primary hyperparathyroidism developed a thoracic spine BT causing T3–T5 spinal cord compression warranting operative decompression.

**Methods:** None.

**Results:** None.

**Conclusions:** BTs should be included in the differential diagnosis in lytic-expansive lesions involving the spine. For those who develop neurological deficits, surgical decompression may be warranted followed by parathyroidectomy.

## Trauma

Oral presentation

### Paradigm shift in surgery for neurotrauma: center-TBI analysis of t-ASDH

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**Objectives:** Comparison effectiveness of strategies preferring acute surgical evacuation with initial conservative treatment in ASDH.

**Background:** Acute surgery in traumatic acute subdural hematoma (ASDH) is based on low-grade evidence.

**Methods:** The European CENTER-TBI, was conducted among patients with t-ASDH, presenting within 24 hours after injury. With instrumental variable analysis, we compared outcomes between centres according to treatment preference, measured by the case-mix adjusted proportion acute surgery per centre. The primary endpoint was functional outcome rated by the 6-months Glasgow Outcome Scale Extended, estimated with ordinal regression as a common odds ratio (OR), adjusted for prespecified confounders. Variation in centre preference was quantified with the median odds ratio (MOR).

**Results:** We included 1407 patients with t-ASDH. Acute surgical evacuation was performed in 336 patients (24%), in 245 (73%) by craniotomy and in 91 (27%) by decompressive craniectomy. Delayed surgery after initial conservative treatment (n=982) occurred in 107 patients (11%). The proportion acute surgery ranged from 7 to 52% (IQR 13-35%) between centres with a twofold higher probability of receiving acute surgery for an identical patient in one versus another random centre (adjusted MOR for acute surgery 1.8 [ $p < 0.0001$ ]). Centre preference for acute surgery over initial conservative treatment was not associated with better outcome (OR per 22% (IQR) more acute surgery in a centre 0.92 [95% CI 0.77-1.09]). This was consistent in the group of patients without unreactive pupils or a GCS of 15.

**Conclusions:** Similar patients with ASDH, without an extremely poor or good prognosis at presentation, were treated differently due to varying treatment preferences. A strategy preferring an aggressive approach of acute surgical evacuation over initial conservative treatment was not associated with better outcome. Therefore, in patients with t-ASDH for whom neurosurgeons see no clear superiority in acute surgery vs. conservative strategy, initial conservative treatment may be considered.

## Trauma

ePoster presentation

### Severe traumatic brain injury in Indigenous of the Western Amazon as a result of collision between two canoes – case report

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**Objectives:** Describe a case of TBI caused by canoe collision in the Amazon region.

**Background:** Traumatic brain injury (TBI) is the leading cause of death and disability in children. Children between 4 to 8 years of age are injured in falls and motor vehicle accidents but also become more at risk for other transportation-related injuries, such as bicycle-related incidents. However, to our knowledge, no case report of severe TBI caused by a canoe collision has been reported.

**Methods:** Case Report.

**Results:** We report the case of a two-year-old indigenous girl, of the Mundurucu ethnic group, in the municipality of Borba in the interior of the State of Amazonas. The distance between this municipality and the capital by river takes about 12 hours. In the Amazon region, especially in indigenous villages, the primary way of transportation is canoes. These are vehicles built of wood so that they can navigate the rivers of the region. In this case, the little Indian was with his parents in the bow of the canoe when another canoe, in the opposite direction, collided with the child. This child was transferred via air ICU to Manaus, the capital of the State of Amazonas. The accident occurred at 9:00 am, and the child arrived for evaluation at the Neurosurgery Service at 8:00 pm.

She was admitted with 8 points on the Glasgow Coma Scale, anisocoria, and brain mass exposure. A brain CT scan showed a cranium depressed fracture and skull base fracture with subdural hemorrhage and brain contusions. We performed a craniotomy with evacuation of the hematomas. She was discharged on the 14th post-operative day alert with no motor deficits.

**Conclusions:** We describe an unusual case of TBI in a child caused by a canoe collision. Although the child had a good prognosis, measures to decrease time to the hospital must be pursued.

## Global Neurosurgery

Oral presentation

Mixed reality tool for craniotomy in neurosurgery: evaluating the benefit of augmented visualization during planning

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**Objectives:** Evaluate the difference between standard neuronavigation vs Mixed Reality (MR) assisted craniotomy among neurosurgeons with different expertise.

**Background:** In modern neurosurgery the progressive widespread of minimal invasive techniques require small and precise craniotomy to treat specific lesions. MR allows to interactively analyze preoperative 2D-3D findings to optimize the surgical planning in the intraoperative scenario.

**Methods:** A 3D phantom was designed from a surgical case and positioned on a head holder for surgical navigation. Automatic segmentation was achieved through our previously approach [Palumbo et al. 2022 MICCAI], allowing to create the patient's 3D model which was visualized on Hololens2 MR headset and automatically aligned on the phantom through surface registration algorithms. All craniotomies traced with and without MR were recorded using an optical tracking system. Distance between tumor and craniotomy, craniotomies centers, craniotomy areas and duration of the procedure were analyzed. A task-analysis questionnaire was filled in by all the participants.

**Results:** 10 Neurosurgeons (5 resident and 5 experienced) were enrolled. The mean tumor-craniotomy distance was inferior in MR group ( $32.4 \pm 0.75$  mm vs  $33.2 \pm 1.2$  mm for MR and NV group respectively). Craniotomies centers mean distance was  $7.9 \pm 3.8$  mm with a 90% of variation in entry point positioning after MR system use. A 25,1% mean reduction in surface area was obtained in MR group. Furthermore, a reduction in procedural time was found using MR. 80% of neurosurgeons involved had never used MR; 60% found the most difficult part to be the learning curve associated with visualization and virtual interaction. All were satisfied about the virtual craniotomy and 50% would have trust MR assisted craniotomy.

**Conclusions:** The MR assisted craniotomy is feasible and automated 3D image registration has the potential to be an accurate tool allowing to improve surgical trajectory and craniotomy planning.

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## Trauma

ePoster presentation

Mortality prognosis at initial evaluation in patients with traumatic brain injury: proposal of a prognosis model for developing countries

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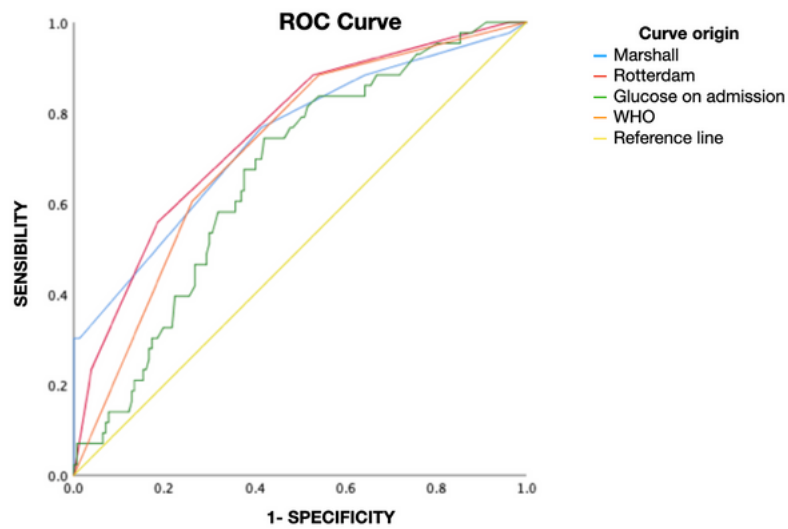
**Objectives:** 1.-Predict the mortality of patients with TBI after their initial neurological evaluation.  
2.-Determine the therapeutic approach to be followed, according the quality of life with which the patient will survive.

**Background:** Head trauma is one of the leading causes of death and disability worldwide and it is considered a public health problem as it predominantly affects the economically active population. It is difficult to establish a prognosis that is considered reliable; however, it is possible to associate the characteristics of a patient on admission with the mortality rate prognosis.

**Methods:** A descriptive and retrospective study was performed, with patients treated in a period of 43 months in a reference center for patients with neurosurgical pathology. Data was collected and 12 variables were established as potential prognostic determinants. For these variables, a univariate statistical analysis was performed, as well as a subsequent multivariate analysis. With these data, a proposed mortality prediction model was established.

**Results:** The demographic variables and prognostic factors of 200 patients with an age range of 15-93 years were analyzed. A mortality of 21.5% was found. The following parameters were determined as factors directly associated with mortality: Glasgow Coma Scale on admission, glycemia >140 mg/dL, and tomography findings using the Marshall and Rotterdam scales. The predictive power of the model was assessed using a receiver-operating curve. The model had 80.4% predictive power to discriminate between surviving and deceased patients. The proposed mortality prognostic model has an Area Under Curve (AUC): 0.804. An AUC value >0.8 indicates that the discriminatory ability of this model to predict in-hospital mortality is good.

Graph 1. ROC curve for prognostic model proposed.



**Conclusions:** Despite good results, this model is still not generalizable. It will be necessary to obtain internal and external validation before applying it to any other unit, as well as obtaining a larger sample.



## Neurovascular Surgery

ePoster presentation

Chris Hani Academic Hospital case series: spinal arteriovenous fistula

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**Objectives:** We present two cases of Type 1 Spinal Arteriovenous Fistulas (AVF) managed at Chris Hani Baragwanath Academic Hospital (CHBAH). Discussing their presentation, diagnostic work-up, and management, while highlighting the complexity in their management.

**Background:** Spinal Arteriovenous Fistulae (AVF) are uncommon pathologies, however when encountered provide a diagnostic and management challenge. The mean time for diagnosis of spinal AVF's is 15 months (in the USA) mostly attributed to the fact that symptoms may be non-specific and not clinically correlating with imaging findings. In South Africa access to tertiary care and specialized imaging may delay presentation even more, however no studies have yet been conducted due to their rarity. Most patients who present with this disease are males in the 5th and 6th Decade of life, who in many cases have associated degenerative spine pathology. Patients with spinal AVF's will progress to worsening neurological deficit over time if not managed. Management, as highlighted in the above two cases can be from an Interventional Radiology route, surgical route or (not discussed) Radio-surgical route.

**Methods:** Two Retrospective Case reports.

**Results:** Case 1: 55 year old male presented with acute paraparesis with bladder bowel dysfunction. The patient underwent Diagnostic MRI, followed by Digital subtraction angiogram which found a T5 AV Fistula. Endovascular treatment proved difficult due to the small caliber and tortuosity of the radicular feeder vessel, and as a result was managed successfully surgically.

Case 2: 49 year old female presented with 15 moth history of spastic paraplegia and sensory level of T7. MRI diagnosed a Spinal AV fistula at L1. The patient underwent a Digital subtraction Angiogram and successful embolization.

**Conclusions:** We highlight the complex vascular anatomy of the spine and discuss two management modalities and their outcomes. This case series reiterates the complex diagnostic challenges for these rare spinal lesions.

## Global Neurosurgery

Oral presentation

The full orbito-zygomatique approach in neurosurgical practice in Chad

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**Objectives:** To evaluate the management of patients who have undergone one piece full OZ.

**Background:** The orbito-zygomatic (OZ) approach is the result of the extension of the pterional approach combined with ablation of the superior-external part of the orbital rim and zygoma. It gives considerable exposure to the orbital cavity, as well as to certain deep structures of the skull base. The single-piece orbito-zygomatic approach is a recent development in neurosurgical practice at the Neurosurgery Department of the Renaissance Hospital in Ndjamen.

**Methods:** This is a prospective, descriptive study carried out in the neurosurgery department since August 2019 on all patients who have undergone full OZ.

**Results:** During the study period, 7 patients were treated by OZ approach. Patients ranged in age from 02 to 51 years, of whom 4 were male. The surgical indications were diverse: 4 cases of orbital tumor, one case of orbito-cerebral tumor, one case of oculo-cerebral trauma by stabbing, and one case of aneurysm of the left posterior communicating cerebral artery. Lesion exposure by OZ is satisfactory and it offers a safe removal of the pathology. As a complication, we report a case of temporal muscle atrophy.

**Conclusions:** The orbito-zygomatic (OZ) approach allows wide exposure of the orbital cavity, the anterior and middle skull base.

## Trauma

ePoster presentation

### Case report: traumatic cerebrospinal fluid rhinorrhoea post nasopharyngeal COVID swab

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**Objectives:** This paper serves to highlight the possible risk of CSF rhinorrhoea secondary to nasopharyngeal swabbing, and marks the 23rd documented case to date of this complication.

**Background:** As of February 2023 there was a total of 672 million confirmed SARS Covid-19 cases worldwide. According to the South African Department of Health (DOH), testing for SARS Covid-19 is carried out via nasopharyngeal swabs, oropharyngeal swabs or on sputum. In our institution all patients were submitted to routine testing by reverse transcriptase– polymerase chain reaction (RT-PCR) detection of the SARS Covid-19 virus (either nasopharyngeal or oropharyngeal swabs) on admission and prior to surgery with little to no counselling on possible risks that they may incur.

In current literature only 22 cases of Cerebrospinal Fluid (CSF) rhinorrhoea after nasopharyngeal swabbing has been documented.

**Methods:** Case Report.

**Results:** We present a 47 year old male, known to the Chris Hani Baragwanath Academic Hospital (CHBAH) Neurosurgical unit in Soweto, South Africa, having undergone resection of a right frontal cerebral Ateriovenous Malformation (AVM) in 2021, presenting with a complaint of left unilateral rhinorrhoea. The patient described a salty taste at the back of his throat and the passage of clear fluid from the left nostril began after nasopharyngeal swab testing for SARS Covid-19 during his previous admission for elective surgical resection of the AVM. MRI Constructive Interference Steady State (CISS) confirmed the diagnosis of a CSF leak from the anterior cranial fossa with a high signal fluid visualised in the left sphenoid sinus and paranasal sinuses on the left. The patient underwent open surgical intradural repair of the CSF leak during which an obvious defect and brain plug were identified in the floor of the anterior cranial fossa and repaired.

**Conclusions:** Nasopharyngeal Covid Testing may not always be as benign as we believe, and appropriate counselling is necessary.

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## Paediatric

Oral presentation

### Analysis of non-ventriculoperitoneal shunts at Red Cross War Memorial Children's Hospital

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**Objectives:** The objective of this study is to evaluate the clinical course of patients having undergone these procedures.

**Background:** At Red Cross War Memorial Children's Hospital (RCCH) it is the preferred practice to use non-ventriculoperitoneal (non-VP) shunts when the peritoneum is ineffective or contra-indicated for cerebrospinal fluid (CSF) diversion, and when endoscopy is not an option.

**Methods:** A single centre retrospective review at RCCH wherein forty-three children with a total of 59 episodes of non-VP shunt placement over a 12-year period were identified for inclusion.

**Results:** Twenty-five ventriculoatrial (VA) and 32 ventriculopleural (VPL) shunts were analysed with a median age at insertion of 2,9 (0,3-14,9) and 5,3 years (0,5-13,4) respectively. The median number of previous shunt procedures prior to VA or VPL shunt insertion was 6,0 (2-28) versus 4,5 (2-17) respectively. Three VA (12,0%) and three VPL (9,4%) shunt patients were lost to follow up. Of those remaining, 10 VA shunts (45,5%) compared to 19 (65,5%) VPL shunts required revision. One ventriculovesical and one ventriculocholecystic shunt were placed in the same patient after 21 and 25 shunt related procedures respectively, and both were revised within 3-weeks of insertion. Median shunt survival was 8 months longer for the VA compared to the VPL shunts, being 13,5 (0-67) and 5 months (0-118) respectively. Complications for VA shunts were low, with the overall shunt sepsis rate in the VA group at 4% (n=1) compared to 15,6% (n=5) in the VPL group.

**Conclusions:** Our findings support that VA and VPL shunts are acceptable second-line options in an already compromised group of patients where safe treatment options are limited, provided attention is paid to the technical details specific to their placement.

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## Trauma

Oral presentation

How to pull out a knife: a South African Neurosurgical Trainees exposure to Non Missile Penetrating Head Injuries (NMPHI)

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**Objectives:** Highlight the exposure that South African Neurosurgical Trainees have to stab heads and discuss the complexities in removing retained blades.

**Background:** South Africa has the third highest crime rate in the world with 76.86/100000. Interpersonal violence contributes a large component of this statistic. During Neurosurgical training in South Africa encountering Non Missile Penetrating Head Injuries (NMPHI) further complicated by retained foreign bodies is common. Great debate in the literature has revolved around the management of such cases as it is believed that patients who present with retained foreign bodies have higher rates of complications compared to their counterparts who were removed in the field. De Villiers reported a 17% rate of infection, a 50% rate of vascular complications, and an overall 17% mortality rate in 93 NMPHI patients. More recently, Harrington et al. studied NMPHI and found that vascular injuries were the most common secondary complication and occurred in 19% of patients. Specifically, pseudoaneurysms (46%) and vessel cutoff (32%) represented the most common secondary vascular complications.

Various methods of blade removal have been described, however no gold-standard has yet been established. While inter-institutional protocols help guide trainees they seem to differ in opinion of the best option for removal:

1. Craniotomy
2. Reverse Hammer Technique
3. Removal in Angio suite

**Methods:** Compare 7 Cases of NMPHI with retained Foreign Bodies. 3 removed during Craniotomy, 3 removed with Reverse hammer technique, and 1 who did not survive to allow for removal.

**Results:** No statistical difference was found in the rate of post removal complications when comparing different methods of foreign body retrieval. However, anatomical location of the stabs did play a major role in mortality rates.

**Conclusions:** South African Neurosurgical trainees are commonly faced with the most complex of NMPHI. Formal guidelines need to be established to help assist trainees in their decision making.

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## Global Neurosurgery

ePoster presentation

How to start a global neurosurgery organisation?

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**Objectives:** Identifying the key steps in starting a global neurosurgery organisation and exploring the available options at each one.

**Background:** Global neurosurgery is one of the most rapidly expanding facets in the field of neurosurgery. Indeed, it is fast becoming its own sub-specialty. Multiple players are responsible for this project, namely individuals, neurosurgical units, international organisations including governments, and grass-roots organisations. Each has its own repertoire of capabilities that allow it to contribute to the collective efforts of global neurosurgery. Though each player is separated by its resources, all play an important role. In 2023, the Scottish Institute of Global Neurosurgery was established. Ours is a grass-roots organisation, and there are no manuals or textbooks detailing how to do this. We wish to share our experience with others so as to offer insight such that others may better navigate these complex waters.

**Methods:** In this examination of our own experiences at the Scottish Institute of Global Neurosurgery, we offer a step-by-step account of the items and components necessary to create a global neurosurgery organisation.

**Results:** Our analysis of that which was necessary to begin the Scottish Institute of Global Neurosurgery yielded the following:

1. A good team
2. A good name
3. Logos and symbols- not simply a form of identification and recognition, there is a deeper meaning within the choices made at this step in representing the character of an organisation
4. Websites and social media- in the world of today this is a mandatory step
5. Funding/Non-profit status
6. A plan- more freedom is available regarding initiatives for grass-roots organisations.

**Conclusions:** Models may prove useful in such efforts. Their establishment and dispersement could potentially serve the greater good that global neurosurgery aims to accomplish by enabling those with even the most limited resources to create their own global neurosurgery organisation.

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## Spine

ePoster presentation

### Surgical management of giant cervical dumbbell-shaped schwannomas: illustrative case and literature review

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**Objectives:** To report the successful management of a giant intra and extradural C5 dumbbell-shaped schwannoma using a unilateral posterior approach without fusion.

**Background:** Dumbbell-shaped tumors account for approximately 6% to 14% of all spinal neoplasms. Depending on the size of their extraforaminal component, a combined posterior and anterior or lateral approach may be required. Only a few cases of giant Dumbbell-shaped cervical neurinomas with large extraforaminal component have been reported so far.

**Methods:** The case of a patient with a C5 giant Dumbbell-shaped neurinoma extending in and 12 cm beyond the spinal foramen is described. Clinical features, diagnosis and nuances regarding the surgical management of this benign tumor are discussed.

**Results:** A 63-year-old lady with a 1-year history of worsening motor impairment of her right arm presented to our outpatient clinic on January 2021. Her neurological examination revealed Brown Sequard syndrome with right exaggerated reflexes and mild proprioceptive loss, and left pain and temperature hypoesthesia.

A cervical spine magnetic resonance imaging scan revealed a large right intra-extradural mass originating from the C5 nerve root, causing major spinal cord compression, enlarging the C5-C6 foramina and extending approximately 12 cm below the level of the C5 vertebra in the paraspinous muscles.

Gross total resection was achieved using a unilateral posterior only approach, addressing the intradural component first, opening the intervertebral foramen and then following the tumor till its most distal part. No stabilization was realized. The patient improved remarkably following surgery and control dynamic X-rays showed no spinal instability. She is symptom free with no radiological sign of recurrence at most recent follow-up examination, two years post-operatively.

**Conclusions:** Giant cervical Dumbbell-shaped schwannomas are uncommon and their surgical treatment is challenging. The posterior unilateral approach without spinal stabilization can be associated with acceptable functional outcomes without compromising the spinal stability.

1295

## Neurovascular Surgery

ePoster presentation

Multiple cerebral cavernous malformations: clinical presentation and management strategies - a case report

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**Objectives:** To report a rare case of multiple cerebral cavernous malformations.

**Background:** A 62-year-old female patient with a history of brain surgery for a "brain tumor" 22 years ago in another facility. She reports experiencing visual changes in her right eye 10 years ago, followed by a seizure three years later. Magnetic resonance imaging (MRI) revealed a left frontal gliosis area, a right intra-axial temporal expansive lesion (Zabramski II), and multiple cavernous malformations (Zabramski IV) in the cerebral hemispheres, cerebellum, and brainstem. She is currently receiving anticonvulsant therapy with seizure control and no focal neurological deficits.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2022, along with a literature review.

**Results:** Cavernous malformations are large abnormal collections of low-flow vascular channels without brain parenchyma between the sinusoidal vessels. The prevalence in the general population ranges from 0.5% to 0.7%, with the most common manifestations being epilepsy (50%), intracranial hemorrhage (25%), and neurological deficits without hemorrhage (25%). However, up to 50% of cases are asymptomatic. They can present as a single lesion or multiple lesions, with the latter representing approximately 20% of cases and often having a familial origin. The initial presentation with hemorrhage and location in the brainstem are significant risk factors for subsequent hemorrhages. MRI is the preferred method for detecting cavernous malformations due to its ability to identify blood degradation products, such as hemosiderin, within and around the lesions. Conversely, the lesions are not visible on angiography. Surgery is the definitive treatment.

**Conclusions:** The management of multiple cavernous malformations should be individualized, taking into consideration the location and the presence of epilepsy when selecting patients for neurosurgery or radiosurgery.



1297

## Functional

ePoster presentation

Unveiling the hidden danger: thrombosis in ventriculoatrial shunt – a rare yet plausible enigma requiring urgent diagnosis and treatment

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**Objectives:** Thrombosis on the distal catheter of the ventriculoatrial(VA) shunt system, a complication of hydrocephalus treatment, poses a rare yet potentially catastrophic threat. This study aims to explore prevalence and etiology of thrombosis in VA shunts, appropriate strategies for diagnosis, intervention, and prevention to mitigate the consequences.

**Background:** 26-year-old male with congenital hydrocephalus and history of multiple shunt revisions(last one being VA shunt 1 month prior); presented to the ER with altered mental status and deteriorated consciousness. Severe headache and vomiting indicated heightened intracranial pressure. The pump was still working properly, while imaging revealed correct position of proximal and distal part of the shunt. Suspecting thrombosis, we promptly performed manual pumping of VA shunt, restoring normal flow. Comprehensive treatment plan including dual antiplatelet therapy and consultation with a cardiologist was initiated to address the potential risks of recurrences.

**Methods:** We are still following up with the case while doing literature review to provide more insights to the matter.

**Results:** Prevalence of VA shunt thrombosis is controversial – 0.3% in clinical studies and 60% in autopsy studies, proving thrombosis as a fatal silent intruder. Thrombosis in VA shunts has multifactorial causes: shunt catheter issues, cerebrospinal fluid dynamics, infections, and genetic factors. Echocardiography plays a crucial role in detecting major cardiac thrombi. Early detection and swift intervention are vital, despite challenges posed by the asymptomatic latency period and the absence of definitive guidelines. Regular follow-up examinations are essential for timely diagnosis and management, reducing morbidity and mortality.

**Conclusions:** Our case report shed light on the hidden dangers of thrombosis in VA shunt patients, emphasizing need for early diagnosis, prompt treatment, and possibly, preventive measures. Vigilance towards subtle symptoms enables early intervention. Regular follow-up examinations facilitate timely management of complications. Diligence in recognizing and managing this enigma will lead to improved outcomes, ultimately protecting patients from potentially devastating consequences.

## Endovascular Neurosurgery

ePoster presentation

### Spinal dural arteriovenous fistula rupture: a rare cause of immediate postpartum paraplegia

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**Objectives:** To report a rare case of a spinal dural arteriovenous fistula of immediate postpartum.

**Background:** A 22-year-old primiparous female patient presented with ascending flaccid paraparesis associated with urinary retention, grade II muscle strength, and paraparesthesia in the lower limbs, starting on the 5th day of the postpartum period. The delivery was vaginal, at 38 weeks, without the use of spinal anesthesia. Initially, Guillain-Barré Syndrome was suspected, but further investigation with magnetic resonance imaging and arteriography revealed a spinal dural arteriovenous fistula (SDAVF) in the lumbar spine. The treatment consisted of complete embolization of the SDAVF. The patient showed improvement in muscle strength within the first 48 hours post-procedure and was able to ambulate with the support of a walker within 72 hours.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2022, along with a literature review.

**Results:** SDAVFs are rare and pose a challenging situation during pregnancy and the postpartum period. Early diagnosis and treatment can prevent long-term disability. Patients with SDAVF typically present with low back pain, progressive myelopathy, sensory changes, and sphincter disturbances. The main risks include hemorrhage, steal phenomena, and mass effect or venous congestion. Pregnant women diagnosed with SDAVF during gestation are recommended to undergo cesarean section to avoid increased pre- and post-fistula pressure during labor, which could lead to rupture. In the described case, the diagnosis was made after delivery. Arteriography is the gold standard for diagnosing SDAVFs, and the definitive treatment is surgical or endovascular.

**Conclusions:** SDAVF rupture is a rare cause of paraplegia during pregnancy and the postpartum period. It is important to recognize this condition in medical practice to ensure early diagnosis and appropriate treatment to prevent disability. Women who have successfully recovered from an SDAVF and received treatment should not be discouraged from future pregnancies.

## Trauma

Oral presentation

Coagulopathy in moderate and severe traumatic brain injury; a prospective study in a trauma centre of a developing country

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**Objectives:** To determine the incidence and effect of coagulopathy on outcome of moderate to severe traumatic brain injury.

**Background:** Coagulopathy remains an important factor that has significant impact on morbidity and mortality associated with traumatic brain injury(TBI). This is not routinely evaluated for during the management of traumatic brain injured patients in many trauma centres. Relatively few data on the incidence and the effect of TBI induced coagulopathy on outcome of TBI have appeared in the literature.

**Methods:** This was a prospective study of patients with isolated moderate(Glasgow coma score of 9-12) and severe traumatic brain injury(Glasgow coma score of 3-8) admitted to the trauma centre over 12 months (January 2020- January 2021).The patients' coagulation profile (prothrombin(PT) time,activated partial thromboplastin time(APTT) ,fibrinogen, and d-dimer) were done on the day of admission and on day three. Coagulopathy was defined as PT or/ and aPTT more than 1.5 times the normal control.All patients were managed according to the hospital protocol, followed up for 30days and the early Glasgow outcome score(GOS) was recorded. Favorable outcome was defined as GOS of 4-5 while unfavourable outcome was defined as GOS of 1-3. Data collected on a structured proforma were analysed using SPSS(R) VERSION 22 statistical software.

**Results:** Ninety five patients were enrolled into the study. Mean age was 28+/- 14 years. Sixty patients had moderate TBI while Thirty five patients had severe TBI. Coagulopathy was present in 63 patients giving an incidence of 66.3%. Coagulopathy was significantly higher in the severe TBI subgroup ,28 (80%) out of 35 patients than the moderate TBI subgroup, 35(58.3%) out of 60 patients (p-value =0.03). Coagulopathy was also significantly associated with unfavourable outcome(Glasgow outcome score of 1-3 at 30 days)(p-value=0.01).

**Conclusions:** The study has shown high incidence of coagulopathy in patients with traumatic brain injury and it was found to be associated with unfavourable outcome.

1300

## Education, Ethics, Socioeconomic

ePoster presentation

### Evaluation of gender and racial dynamics in leadership roles within academic neurosurgery and orthopaedic surgery

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**Objectives:** 1. To assess for differences in leadership diversity on journal editorial boards and society executive boards in neurosurgery and orthopaedic surgery.

2. To assess for differences in diversity between journal and society leadership.

**Background:** Neurosurgery and Orthopedic Surgery have historically exhibited limited diversity, with Caucasian males occupying the majority of leadership roles. Despite an increasing proportion of women entering these fields, there has not been a concomitant increase in female and minority-occupied leadership positions, particularly at the higher levels of academic surgery. To assess leadership diversity, we analyzed the perceived gender and racial distribution of those occupying leadership positions on journal editorial and society executive boards within neurosurgery and orthopaedic surgery.

**Methods:** The top three journals and journal-affiliated societies based on impact factor for subspecialties within neurosurgery and orthopaedic surgery were included. The perceived gender and race of individuals holding leadership positions was identified from corresponding websites and a focused search through institutional profiles.

**Results:** Perceived diversity amongst the leadership of 27 journals and 28 societies was reviewed. Orthopaedic surgery had a significantly ( $p < 0.05$ ) lower proportion of females and intersectional minorities, being both non-male and non-caucasian, on the boards of included journals and societies. Additionally, orthopaedic surgery demonstrated a lower proportion of perceived minorities (19.5%) compared to neurosurgery (37.7%), although this was not significant ( $p = 0.0923$ ). Of journal editor-in-chiefs and society presidents, neurosurgery demonstrated a greater mean proportion of females (21.94% vs. 11.14%) and minorities (37.76% vs. 19.47%).

**Conclusions:** Efforts towards improving representation of underrepresented groups, particularly female minorities, on journal editorial and society executive boards are required to facilitate a top-down approach towards gender and racial parity. In comparison to past studies, we have found progress towards more equitable representation in visible leadership roles within neurosurgery. However, orthopaedic surgery remains predominantly male and Caucasian, with a significant paucity of intersectional minorities.

1301

## Paediatric

ePoster presentation

Ultrasound guided lavage and evacuation of intraventricular abscess in a neonate with Chiari II - case report and literature review

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**Objectives:** To present a neonate with Chiari II and intraventricular abscess managed with ultrasound guided technique

**Background:** Chiari II malformation is a relatively common congenital malformation characterized by multiple hindbrain abnormalities<sup>1</sup>. It is commonly associated with a neural tube defect in more than 95% of the cases, with myelomeningocele being the most common<sup>2</sup>. A leaking myelomeningocele requires emergent repair and should be performed within the first 72 hours after birth<sup>3</sup>. Delayed repair is associated with a significant increase in morbidity and mortality.

**Methods:** We report a case of a neonate with Chiari II malformation and intraventricular abscess managed with ultrasound guided lavage prior to repair of the myelomeningocele.

**Results:** We are presented with a 1 month old male born with Chiari II, with a leaking thoracolumbar myelomeningocele who was refused admission at multiple centers and was sent home. He was eventually admitted at our institution with cranial ultrasound showing intraventricular abscess collection on the left and granulation tissue over the thoracolumbar myelomeningocele. Management included utilization of Realtime ultrasound guidance during irrigation and evacuation of an Intraventricular abscess, which is a safe and cost effective procedure. After which, patient underwent repair of the myelomeningocele on the same OR setting. Patient then completed 7 weeks of antibiotics and eventually underwent ventriculoperitoneal shunt insertion.

**Conclusions:** Realtime ultrasound guidance during irrigation and evacuation of an Intraventricular abscess, is a safe and cost effective procedure. It may provide multiple advantages from catheter placement and catheter movement toward the areas of the abscess within the ventricular system.

1302

## Global Neurosurgery

Oral presentation

Frequency of post-operative CSF diversion in patients with third ventricular colloid cyst: a single center retrospective analysis

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**Objectives:** We evaluated the need for permanent CSF diversion in patients operated for third ventricular colloid cyst (TVCS).

**Background:** Patients treated for TVCS may continue to have symptomatic hydrocephalus postoperatively. It usually requires CSF diversion. Several factors have been linked to postoperative hydrocephalus in these patients and different management options have been advocated but the evidence is scarce.

**Methods:** This was a retrospective chart review of patients who were operated on for a TVCS between 1st January 2009 and 31st December 2022 at a single tertiary care center in LMIC. Data was collected on pre-formed proformas by reviewing patient hospital records and follow-up data for up to one year was recorded.

**Results:** Fifty-five patients, (36 males and 19 females) were included in the study with a mean age of  $35.89 \pm 13.16$  years. Headache was the most common presenting symptom (92.7%), followed by vomiting (30.9%). The mean cyst volume was  $1.89 \text{cm}^3$  (IQR: 2-5). Hydrocephalus was appreciated in 54 (98.2%) imaging studies. Patients were treated via transcortical open microsurgical (34.5%), transcortical endoscopic (61.8%), and transcallosal (3.6%) approaches. Forty-seven (85.5%) needed temporary CSF diversion at primary surgery. Postoperative hydrocephalus was found in 20 (34.5%) postoperative scans. CSF leak (20%) was the most common complication followed by meningitis (18.2%). Permanent CSF diversion by means of VPS was needed in 8 (14.5%) patients. Out of the possible predictors of postoperative hydrocephalus, none was significantly associated with the need for post-resection shunting. Of note, however, is that of the 11 patients who underwent endoscopic third ventriculostomy, none required a CSF diversion procedure or had CSF leak postoperatively, though this relationship was not significant.

**Conclusions:** The rate of CSF diversion and postoperative complications following the excision of the third ventricular colloid cyst is high. Large sample size studies are needed to accurately predict the possible risk factors and to prevent postoperative complications.

1303

## Spine

Oral presentation

### Journey of cervical disc replacement in twenty first century flashback and challenges

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**Objectives:** The objectives of this study was to find out if cervical disc replacement for cervical disc prolapse with radiculopathy, myeloradiculopathy for single or bilevel cervical disc prolapse improves radiculopathy and myelopathic symptoms and also continues to preserve the cervical physiological neck movement.

**Background:** Cervical disc replacement is a new concept in 21<sup>st</sup> century and rapidly developing surgical treatment. A prospective study was conducted to determine, If accurately implanted Bryan's cervical disc prostheses can provide relief from objective neurological symptoms and signs, stability and normal range of motion in cases of cervical disc prolapse with Myeloradiculopathy.

**Methods:** Three hundred and twenty patients underwent cervical disc replacement from Dec 2001 to Dec 2018. All patients with degenerative cervical disc prolapse at C3-C7 with radiculopathy, Myeloradiculopathy were included in this study. Patients with unstable spine, trauma, tumor and osteoporosis were excluded from this study. Patients were operated by anterior cervical approach using a specially designed cervical discectomy system. Neurological and radiological outcome was assessed post operatively and at 02 months, 06 months, 01 year and 02 yrs follow up. Outcome analysis was carried out using modified Odom's criteria and VAS Score. The radiographic results were assessed by taking antero posterior (AP) and lateral radiographs of cervical spine to find range of motion and device position.

#### **Results:**

**Results:** The patients were in the age group of 20 to 65 yrs with average age of 42 years. There were 224 (70 %) males and 96 (30 %) females in this study. Neck pain and brachialgia were the presenting symptoms in all cases, 192 (60 %) had radiculopathy and 128 (40 %) had myelopathy. Single level disc prolapse was present in 300(93%) cases as per Magnetic Resonance Imaging (MRI). 20% at C4-C5, 60% at C5-C6 and 20% at C6-C7. Two level disc prolapse was present in 20 cases. Ten at C4-C5 and C5-C6 and another ten at C5-C6 and C6-C7. Bryan's disc sizes 14 to 18 and Prestige disc size 8 to 10 were used. There was no intraoperative complications. Two patients developed transient hoarseness of voice postoperatively, which recovered in two months. During immediate post-op, 02 months, 06 months, 01 year & 02 yrs follow up the clinical outcome was excellent in 256 (80%) and good in 64 (20%) as per Odom's criteria. VAS score for arm pain reduced from 8 to 4, then 2, then 2 at 3,6,12,24 months followed respectively. VAS score for neck pain followed a similar trend. There was demonstrated motion in flexion, extension, and rotation clinically during post op and follow up periods. There was no migration or displacement of device.

**Conclusions:** Cervical disc replacement for cervical disc prolapse with radiculopathy, myeloradiculopathy represents an exciting new technology. Patients treated with Bryan cervical or prestige disc prosthesis for single bi-level cervical disc prolapse showed good to excellent results during post op and follow up period. Intra op and post op complications were not observed. Results from this study are encouraging. Presently this is accepted as a treatment options with cervical radiculopathy and myeloradiculopathy.

1304

## Endovascular Neurosurgery

ePoster presentation

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**Objectives:** The study evaluates the short- and long-term clinical outcomes and quality of life in patients undergoing endovascular embolization for VGAMs.

**Background:** Vein of Galen Aneurysmal Malformations (VGAMs) are high-flow intracranial arteriovenous aneurysms, with the majority found in neonates and infants. Previously, patients were treated surgically, however, due to its high mortality rates endovascular therapy soon took over. Its long-term outcomes and impact on the quality of life, however, are still not well-established due to the rarity of disease occurrence.

**Methods:** This is a retrospective review of patients with VGAM who underwent endovascular embolization at our center between 2000 and 2022. Patients with aneurysms without true malformation, who underwent any cycle of angioembolization from another center, or who had galenic dural arteriovenous fistulas were excluded. Clinical, radiological, and embolization-related features were noted. King's Outcome Scale for Childhood Injury (KOSCHI) score was used to evaluate the long-term neurocognitive outcomes. Patients were classified into three groups: good outcome (KOSCHI=5-4b), poor outcome (KOSCHI=4a-2), and deceased. Eight items from the Rivermead Postconcussion Symptoms Questionnaire were used to evaluate the quality of life.

**Results:** The study included seven patients. VGAMs were initially diagnosed in the prenatal period (1/7), childhood (3/7), and adulthood (3/7). On angioarchitecture, they were classified as either choroidal (3/7), mural (3/7), or mixed (1/7). The majority of patients initially had ventriculomegaly and showed hydrocephalus- or mass-effect-related symptoms. The cohort underwent 10 embolization procedures and was advised 1 to 3 treatment stages per patient. One mortality, two poor outcomes, and four good outcomes were reported. Subarachnoid and intraventricular hemorrhage were the main causes of patients' worsening. Fatigue, irritability, and feeling of frustration were the most common behavioral problems encountered in the long term.

**Conclusions:** The outcomes after angioembolization for VGAM seem favorable, however, studies with larger sample sizes are required to establish the predictor-outcome association.



1305

## Oncology

Oral presentation

Intraoperative radiotherapy combined with spinal stabilization surgery. A novel treatment strategy for spinal metastases. First experiences at a single center

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**Objectives:** We describe the feasibility, morbidity and mortality of a novel treatment protocol for SM combining spinal stabilization surgery with ioRT.

**Background:** Contemporary treatment of spinal metastases (SM) aims on preserving spinal stability, neurological status, local control and functional status. It consists of spinal surgery followed by radio- and chemotherapy. Adjuvant therapy is performed after several weeks to prevent wound healing issues. Intraoperative radiotherapy (ioRT) is a solution to shorten treatment time, successfully applied in brain tumor, breast and colorectal surgery but not SM to date.

**Methods:** Results on morbidity and mortality of ioRT combined with stabilization surgery in SM in a first single center series are described. Stabilization is performed as CT-navigated open or percutaneous procedure using a carbon screw-rod system followed by 50kV photon-ioRT using the ZEISS Intrabeam during a single session in prone position. The ioRT probe is placed through a guide canula via navigation and positioning is controlled by ioCT to enable RT isodose planning in the OR. Patient characteristics, perioperative specifications and postoperative follow up along with adverse events (AE) are reported.

**Results:** 11 (7 female) patients (69±9.4y) received treatment from 07/22-04/23. Median SINS was 8 [7-10] IQR, with metastasis located in thoracic (n=9) and lumbar (n=2) spine. 6 patients receive open, 4 percutaneous stabilization and 1 decompression only. Mean length of surgery was 153±52 min. with 2 Patients receiving 4 and 8 patients receiving 8 screws respectively. In 2 Patients radiotherapy was not completed due to bending of the guide canula with consecutive security abortion of ioRT. All other patients received 8Gy isodoses during 2-6min.. Patients treated had ESCC 1a-2. Mean follow up was 63±49 days. 4 patients experienced AEs including 1 case of fatal surgical site infection.

**Conclusions:** 50kV photon ioRT for SM can be a promising technique for selected cases of SM.

1306

## Oncology

Oral presentation

Intraoperative radiotherapy in brain metastasis surgery results in less radionecrosis with equal oncologic outcome

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**Objectives:** Aim of this study is to compare outcome, local control and the rate of radionecrosis (RN) in patients that underwent resection of Brain metastases (BM) with adjuvant stereotactic radiotherapy (SRS) compared with intraoperative radiotherapy (ioRT).

**Background:** In the treatment of BM, whole brain radiotherapy has been replaced by SRS of the resection cavity due neurocognitive favorable outcome. ioRT theroretically offers a beneficial treatment profile in the treatment of BM. Whether this is reflected in postoperative outcome remains little investigated.

**Methods:** We performed a retrospective single center analysis comparing patients receiving either SRS after BM resection or ioRT between 2013 and 2021 with respect to RN, overall survival and local control.

**Results:** We analyzed 129 patients receiving 137 radiations of the resection cavity (SRS:72/75; ioRT:57/62). Surgery was prolonged by mn. 25min. in the ioRT group (SRS:137 min[66-137 vs. ioRT:162[89-308]. Length of hospitalization was mdn. 8d[3-41] in the SRS vs. 7[2-41] in the ioRT group. 1-year overall survival (SRS: 59.8% (95%CI 45.8-71.3%) vs ioRT: 62.9% (95%CI 46.0-75.8%) p=0.957) and local control (SRS:87.7% (95% CI 72.2-94.9%) vs. ioRT: 84.3% (95% CI 66.0-93.2%) p=0.491) showed no significant difference.

Patients treated with ioRT showed significantly lower 1-year rates of RN (ioRT:5.3% (95% CI 13.6-43.5%) vs. SRS:25.1% (95% CI 13.6-43.5%) p<.0001).

**Conclusions:** ioRT seems not to be inferior to SRS regarding overall survival and local control in the treatment of BM, with significantly lower rates of RN.

1307

## Trauma

ePoster presentation

Simultaneous or staged operation for cranioplasty and ventriculo-peritoneal shunt implantation in patient undergoing decompressive craniectomy

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**Objectives:** To evaluate the safety of simultaneous operation for cranioplasty and ventriculo-peritoneal shunt implantation in patients after decompressive craniectomy.

**Background:** Patients who received decompressive craniectomy may need further cranioplasty and ventriculo-peritoneal shunt (VPS) after initial stabilization. Cranioplasty and VPS usually performed separately in most centers with the concern of peri-operative complications, such as surgical site infection or poor wound healing which may further lead to re-operation. However, many neurosurgeons now perform simultaneous operation to minimize anesthesia, reduce medical cost, and earlier entry to rehabilitation program. However, the complication rate between simultaneous and staged operation is still under debate. In this study, we aim to evaluate the safety and benefits of simultaneous operation.

**Methods:** We retrospectively reviewing patients who received cranioplasty and ventriculo-peritoneal shunt implantation between January 2014 and December 2020 at Keelung Chang Gung memorial hospital. Patients were divided into 2 groups: Group 1 (simultaneous operation), group 2 (staged operation). Outcome and complications were analyzed through Student's t and Chi square tests.

**Results:** Our study includes 56 patients, 20 in group 1 and 36 in group 2. The complication rate in staged operation was significantly higher than simultaneous operation (25% vs. 15%,  $P=0.024$ ). No statistically significance differences between two groups when comparing intensive care unit and hospital stay, post-operation Glasgow Coma Scale.

**Conclusions:** Performing cranioplasty and ventriculo-peritoneal shunt implantation simultaneously is safe according to our study. Overall outcomes are similar between staged operation and simultaneous operation.

1308

## Epilepsy

Oral presentation

### Minimally invasive endoscopic management of hypothalamic hamartoma – a Single center experience

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**Objectives:** We aim to present our experience to the surgical management of drug resistant hypothalamic hamatomas (HH) using minimally invasive endoscopic techniques.

**Background:** Hamartoma disconnection from the hypothalamus, gross total (GTR) or subtotal resection (STR) is a paramount predictor in achieving optimum post-surgical seizure outcome and symptom regress. However being characteristically a deep sited lesion, microsurgical techniques are often confronted with unwanted postsurgical morbidity, while other minimum invasive methods (Gamma Knife radiosurgery, Stereotactic radiofrequency thermocoagulation) are either lesion size dependent or predispose to endocrine impairment.

**Methods:** 15 surgical procedures were performed at the federal center of neurosurgery over a period of seven years with Prof. Sufianov A.A. as the lead neurosurgeon. In all cases, BrainLab (Germany) neuronavigation was used for performing the approach. The main trajectory was planned contralateral to the implantation plane of HH. In most cases (n=14) we used a needle semirigid endoscope (Karl Storz, Germany), interventional sialendoscopy (Karl Storz, Germany) (operating sheath, biopsy forceps) and Thulium: YAG laser (Quanta System, Italy); and Little Lotta (Karl Storz, Germany) with Thulium: YAG laser.

**Results:** In 14 patient endoscopic disconnection was performed, and in one patient, endoscopic assisted resection of HH was performed. 14 patients achieved a satisfactory postoperative Engel score (I-II). In 1 patient with Pallister-Hall syndrome, did not achieve significant improvements (Engel Class IV). Post operatively most patients did not exhibit neurological, endocrinological, or electrolyte disturbances.

**Conclusions:** Endoscopic technique provides a safe surgical approach to hypothalamic hamatomas with good post-operative results and minimal morbidity.

1309

## Global Neurosurgery

ePoster presentation

Microsurgical resection of intracranial tumors with preoperative embolization: retrospective analysis of a single center experience

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**Objectives:** 1. Preoperative embolization is still controversial

2. Investigation of the safety and efficacy of preoperative embolization will be discussed

**Background:** Preoperative embolization for hypervascular tumors is still a controversial procedure. However, it is a relatively safe method of reducing intraoperative bleeding. The aim of this study is to investigate the safety and outcome of preoperative embolization in neurosurgical practice.

**Methods:** In selected cases, arterial feeders of the tumor were embolized before surgical resection in a one or two-staged fashion at our institution. Clinical data, tumor characteristics, intraoperative bleeding, blood transfusion, decrease in hematocrit levels, and complications regarding embolization were collected retrospectively.

**Results:** From January 2016 to May 2023, a total of 35 adult patients with intracranial tumors, which were evaluated as hypervascular lesions on pre-operative MRI, operated on with preoperative embolization, were enrolled in this study. 14 of the patients were male, and the mean age was 52.6. The most common pathology was meningioma (77,1%), followed by hemangioblastoma (11,4 %). 18 of the patients (51,4%) were treated in a onestaged fashion. The mean percentage of tumor devascularization was 85%, and gross total resection was achieved in 29 of the patients (82,8%). There was no major complication regarding the angiogram; however, one patient had skin necrosis due to embolization. The overall mean blood loss was 303,3 mL. The average decrease in hematocrit levels was 3,6 after the surgery. 17 (48,6%) of the patients received a blood transfusion.

**Conclusions:** Preoperative embolization is an effective method with selected hypervascular tumors. It helps to decrease intraoperative blood loss and facilitates tumor resection.

1310

## Oncology

Oral presentation

### Enhancing radiomics in neurosurgery: insights from a set of studies

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**Objectives:** This study aimed to assess the relation between radiomic features of oncological and traumatic brain lesions with biological and clinical variables in a set of medium-sample studies.

**Background:** Nowadays, the quantitative analysis of multimodal MRI and PET/CT data in patients with brain tumors and traumatic brain injury is not strictly standardized in the clinic and does not exclude the human factor. Radiomics and radiogenomics can enhance this analysis by objectively generating multiple features that may hold significant clinical value. In this set of three substudies, we aimed to determine the association of radiomic features with genetic data, biological aggression of pathological lesion, and clinical outcome.

**Methods:** In this study we utilized PET/CT scans in 40 patients with glioblastoma, MRI (T1, T1 contrast-enhanced, T2 and T2 FLAIR) in 53 patients with neurofibromatosis II and MR Diffusion Kurtosis Imaging (DKI) in 33 patients with diffuse traumatic brain injury. Data processing and radiomics calculation were performed via the RIA package in the R programming language environment (version 4.2.2).

**Results:** We were able to show a significant correlation between the radiomics-based machine learning models and tumor-to-normal brain ratio obtained by PET in glioblastomas ( $\rho = 0.71$  [0.55;0.82],  $p = 0.01$ ), explore the differences in MRI radiomic patterns for mosaic and germinal mutations in patients with neurofibromatosis II ( $p < 0,05$ ) and predict the favorable TBI outcome by DKI radiomics features (accuracy = 0.90, sensitivity = 0.92, specificity = 0.87,  $F1 = 0.93$ , ROC AUC = 0.97).

**Conclusions:** Radiomics enables utilizing texture properties of neuroimaging in different modalities that may reflect the clinical importance of brain lesions and can potentially augment the radiological assessment. Despite the current limitations in the application, these results indicate the promising potential of radiomics in neuroimaging. The regularities found in this research should be tested with a larger amount of data.

1311

## Global Neurosurgery

ePoster presentation

Intra cranial presentation of fungal infection in post COVID era

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**Objectives:** To discuss about various types of Presentation of Intra cranial Fungal infection following COVID 19 Pandemic.

**Background:** Intra cranial Fungal infection were rare prior to Covid Pandemic. They can occur in immunocompromised persons as a discrete small lesions. During Pandemic second wave, many survivors presented with Fungal sinusitis and intra cranial extension of the same. We present such few situations where we surgically intervened and found to have various different presentations.

**Methods:** In this presentation various intra cranial Fungal infections will be discussed. All these Patients treated at Department of Neurosurgery, Kovai Medical Center Hospital [KMCH], Coimbatore during May 2021 to May 2023.

**Results:** We have encountered many fungal sinusitis which required FESS for diagnosis in earlier period and around 15 patients underwent aggressive surgical intervention for Intra cranial abscess formation. Later period, Patients presented with more solid form of Space occupying lesions almost mimicking Meningioma type encountered. Intra cranial Fungal lesion presents as Space Occupying lesions, Paralysis, Cranial Nerve involvement and Ischemic complications. Initially Fungal infection produces thrombus in the nearby vessels mainly in Frontal region causing necrosis and Abscess formation. But later period, they present mainly as SOL, Cranial nerve involvement and Stroke like picture. Initial period patients developed severe morbidity and mortality which subsequently improved with both aggressive surgical and Medical management.

**Conclusions:** Aggressive surgical management to reduce the burden of SOL followed by Antifungal therapy helped to overcome the morbidity and mortality of this dreaded complication.

1312

## Spine

Oral presentation

Comparative outcome analysis of early versus late surgical decompression in patients with acute sub axial cervical spinal cord injury

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**Objectives:** The aim of this study was to evaluate the clinical outcome between early versus late surgery in patients of acute sub axial cervical spinal cord injury.

**Background:** The role of timing for surgical decompression after an acute sub axial cervical spinal cord injury remains controversial.

**Methods:** All the patients undergoing surgical treatment for an acute sub axial cervical spinal cord injury in the department of neurosurgery at UPUMS Saifai Etawah India between November 2016 to June 2022 were reviewed retrospectively. All the cases were evaluated with respect to their age, sex, mode of injury, radiological findings, time interval between injury and surgery, pre and post operative neurological status and post operative complications. Patients were divided into early group (operated with in 72 hours of injury) and late group (operated after 72 hours of injury). ASIA impairment scale was used to assess the pre and post operative neurological status.

**Results:** The mean age of the patients was  $37.3 \pm 13.5$  years in early group and  $35.8 \pm 12.2$  in late group. Male to female ratio in early and late group was 1.79:1 and 1.27:1 respectively. Out of 137, early surgical decompression was done in 53 cases and late in 84 cases. Majority of the cases in the late group (n=52, 61.90%) remained in same ASIA score as in pre operative state as compare to early group (n=22, 41.51%) ( $p < .01$ ). Postoperatively, improvement in ASIA score (1 grade) was significantly higher in early group (n=16, 30.19%) as compare to late group (n=17, 20.23%) ( $p < 0.01$ ). There were no significant difference in the post operative complications in both group ( $p = 0.73$ ).

**Conclusions:** Early surgery in patients with acute sub axial cervical spinal cord injury had improved outcomes and lesser complications as compare to delayed surgery.



1313

## Oncology

ePoster presentation

Lhermitte Duclos Disease, report of a case

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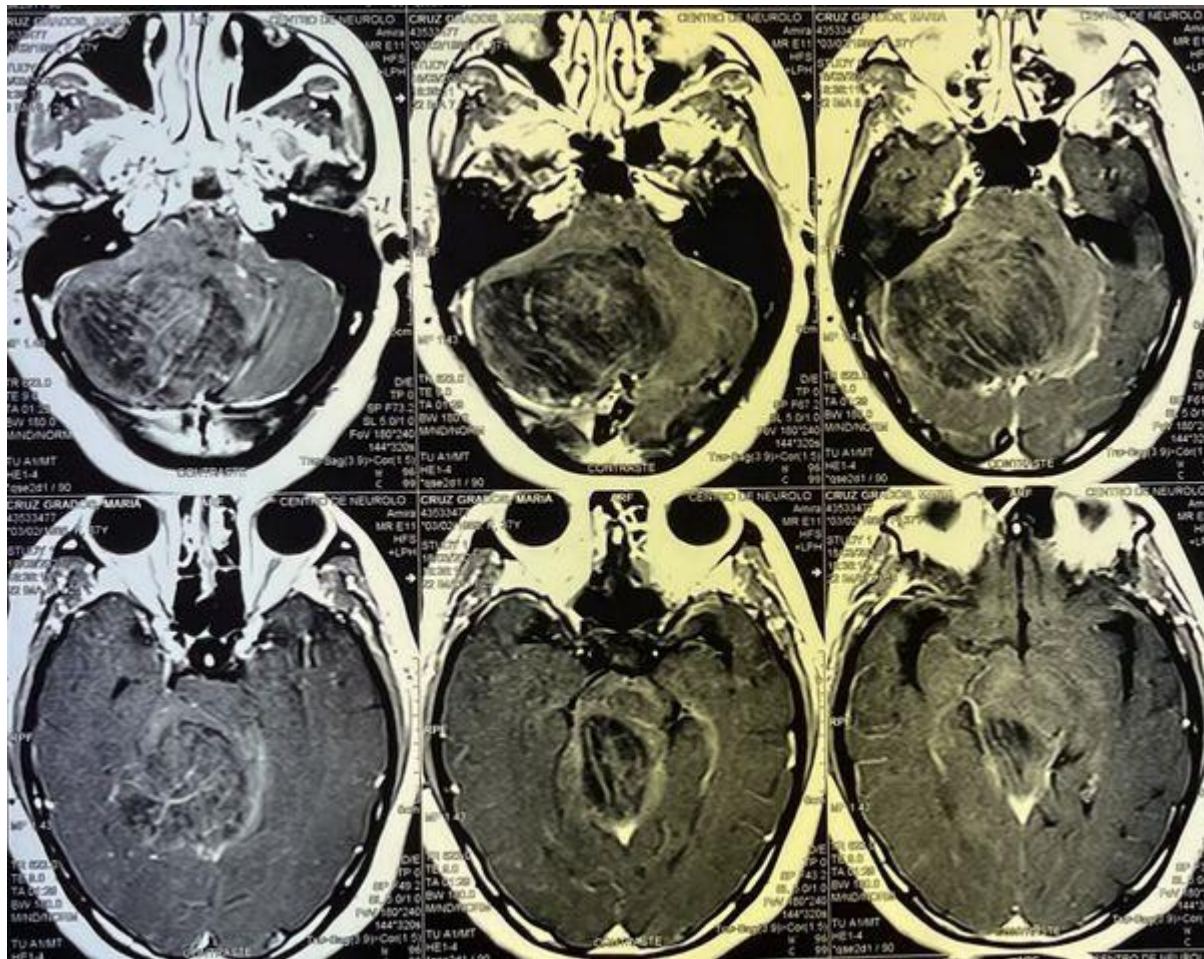
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### Objectives:

1. To present a case of Lhermitte-Duclos Disease, including the clinical presentation, diagnostic workup, and management strategies.
2. To discuss the surgical management options and their role in relieving mass effect and improving neurological symptoms.
3. To contribute to the existing medical literature on Lhermitte-Duclos Disease and increase awareness about this rare cerebellar disorder.

**Background:** Lhermitte-Duclos Disease (LDD), also known as dysplastic gangliocytoma of the cerebellum, is a rare and benign tumor-like condition that affects the cerebellum. It is characterized by hypertrophy and disorganization of the cerebellar folia, leading to various neurological symptoms. This report presents a case of Lhermitte-Duclos Disease in a 37-year-old female patient, discussing the clinical presentation, diagnostic workup, and management strategies.

**Methods:** A 37-year-old female presented with a five-year history of progressive headache, unsteady gait, and difficulty with fine motor skills. Neurological examination revealed dysmetria, intention tremor, and dysarthria. Magnetic resonance imaging (MRI) of the brain demonstrated a cerebellar lesion characterized by enlarged and thickened folia, giving a characteristic "tiger-striped" appearance. Based on the clinical presentation and characteristic radiological findings, a provisional diagnosis of Lhermitte-Duclos Disease was made.



**Results:**

Surgical intervention was chosen as the primary treatment option. The patient underwent a craniotomy and partial resection of the lesion to relieve mass effect and improve symptoms. Histopathological examination revealed an abnormal proliferation of dysplastic ganglion cells, confirming the diagnosis of LDD. Postoperative recovery was uneventful, with significant improvement in gait and fine motor skills.

**Conclusions:** Lhermitte-Duclos Disease is a rare cerebellar disorder characterized by hypertrophy and disorganization of the cerebellar folia. Prompt recognition and diagnosis are essential for appropriate management. Surgical intervention, when feasible, can provide symptomatic relief and improve the quality of life for affected individuals. Long-term follow-up is necessary to monitor for disease recurrence or progression.

1314

## Trauma

Oral presentation

### Outcome of decompressive craniectomy following traumatic brain injury in a select South African population

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**Objectives:** To describe the outcome of decompressive craniectomy (DC) following traumatic brain injury in an environment when patients typically present after 6 hours.

**Background:** Indications for DC remain unclear. Time to surgery is an important predictor of outcome. Majority of patients in our environment present in a delayed fashion. Outcomes of DC have not been studied in this group.

**Methods:** A retrospective chart review of consecutive patients that presented to Inkosi Albert Luthuli Central Hospital undergoing DC following TBI from January 2016 to December 2017 was performed. Data was collected from the hospital's electronic patient record system. Demographic, clinical, radiological, treatment and outcome variables were analyzed using IBM SPSS version 28. Pearson's chi square tests were used to assess associations between categorical variables. A p value <0.05 was considered statistically significant.

**Results:** A total of 107 patients underwent decompressive craniectomy during the study period. There were 97 males and 10 females. Mean age was 29.6 years. Median time from injury to admission was 24 hours (n=33) with an interquartile range of 12 to 24.5 hours. Assault was the most common mechanism of injury (40%) followed by motor vehicle accidents (30.9%). Mean midline shift was 6.47 mm (range: 0 – 15mm) and 50% were Marshall grade 6. Craniectomy size was > 15cm in 8.4%, 12-15cm in 7.5% and <12 cm in 48.6%. Mortality rate was (23.4%). Of the 82 patients that survived, 43 (52.4%) underwent cranioplasty with a median time to cranioplasty of 26.5 weeks. A favorable outcome (GOS 4 and 5) was seen in 93.3% of patients after cranioplasty.

**Conclusions:** In our environment, most patients undergoing DC following TBI are males following assault. Despite delay in presentation over 24 hours, favorable results can be obtained in selected sub-group of patients.

1315

## Skull Base

ePoster presentation

Empty sella and acromegaly: case series of 31 cases

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**Objectives:** Empty Sella and Acromegaly: Case Series of 31 cases.

**Background:** Investigating empty sella (ES) in patients with acromegaly for possible etiology, complications, and treatment options

**Methods:** Among over 2000 skull base masses that were managed in our center since 2013, 220 were adenomas with signs of acromegaly. Clinical, surgical, and imaging data were collected from hospital records to check for sella that lacked pituitary tissue on routine imaging.

**Results:** We found 31 patients with ES in our case mix of patients. The mean age was 46 years with same male to female ratio. Surgical data was available for 23 patients. Six patients had adenoma invasion into the clivus or sphenoid sinus. The tumor extended into the cavernous sinus in ten patients. Cerebrospinal fluid leak was observed in three patients during surgery. Hormonal laboratory data were available for 17 patients. GH/IGF1 was controlled without any replacement therapy in nine patients. The most common simultaneous hormonal disturbance was high prolactin levels. No pituitary hormonal abnormalities occurred after transsphenoidal surgery except for hypothyroidism in one patient.

**Conclusions:** Primary ES is not an unusual finding in acromegaly patients and the reason behind it is obscure. Skull base surgeons should be aware of the condition and look for the remnants of pituitary tissue though the imaging showing sella filled with fluid.

1316

## Oncology

ePoster presentation

### A glioblastoma primary cell lines-derived 3D platform to study drug development and personalized medicine

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**Objectives:** The aim of this study is to contribute to strengthening the knowledge of the biology of high-grade gliomas, generating 3D models useful in the search for new biomarkers and in understanding the molecular mechanisms of its pathogenesis and progression.

**Background:** Several experimental models, such as in vitro cultures and xenotransplantation, have contributed to the current understanding of the biological mechanisms underlying the pathogenesis of high-grade gliomas. Two-dimensional (2D) cell cultures do not mimic in vivo tumor growth satisfactorily. Three-dimensional spheroid culture models have been developed. These models may be particularly important in the field of neuro-oncology. Indeed, brain tumors have a tendency to invade the healthy brain environment. 3D spheroids reproduce the spatial complexity of the tumor mass and represent a useful system for phenotypic, molecular and genetic analyses, as well as facilitate drug screening and biomarker identification.

**Methods:** From January 2022 to May 2023, 20 patients were enrolled whose neuroradiological imaging was compatible with the diagnostic suspicion of high-grade glioma. It was possible to obtain primary cultures from the surgical material on all enrolled patients. Proliferation and invasiveness tests were carried out on them. The cells were characterized by immunomorphological analysis. 3D spheroids were obtained from primary cultures, which were subsequently analyzed from a morphological point of view and for the expression of markers, such as molecular chaperones.

**Results:** The primary cells obtained preserve the tumor phenotype and the typical intratumoral heterogeneity of high-grade glioma and express high expression levels of molecular chaperones involved in tumor proliferation. The 3D spheroids generated through a multiplex and high-throughput approach are able to reproduce the spatial organization and the tumor microenvironment.

**Conclusions:** The study of tumor spheroids allows the study of tumor characteristics including proliferation, invasion and migration, cell death and response to drugs. Tumor cells invade the 3D matrix forming an invasive microtumor.

1317

## Oncology

ePoster presentation

### Primary intramedullary lymphoma of spinal cord: a systematic review of case reports of two decades

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**Objectives:** To determine the clinical manifestations, disease course and neurooncological management of PILSC.

**Background:** Primary central nervous system lymphoma accounts for three percent of all newly diagnosed CNS tumors and one to three percent of all non-Hodgkin's lymphomas. The oncologic origin of primary intramedullary lymphoma of the spinal cord (PILSC) is an enigma.

**Methods:** A comprehensive literature search using PubMed Central, Google Scholar and Scopus was done, retrieving 17 case reports and two case series of 21 patients with PILSC and included using the PRISMA guidelines, published between 2000 and 2023.

**Results:** About 90.48% patients inflicted with PILSC were adult, with male predominance, 61.90%. The most common complaint at presentation was neurological deficit of motor type in 32.14% patients. Magnetic resonance imaging (MRI) proved to be helpful in 76.19% cases, with spinal cord enlargement and high signal intensity in 19.04% cases each and variable intensity of lesions in T1 and T2-weighted images. Laminectomy was performed in 52% cases. Adjuvant chemotherapy and radiotherapy was acquired by 52.38% and 38.09% patients. Non-Hodgkin type was reported in 90.47% cases and Hodgkin lymphoma was seen in 9.52% patients. Diffuse large B cell lymphoma was culprit in 41.10% cases. Five out of 21 cases had variable post-operative complications. The average follow-up was 16.16 months.

**Conclusions:** PILSC is highly variable in all clinico-pathological aspects of presentation. Although rare, PILSC can involve adult and paediatric populations with a clear male preponderance. It has a multifaceted clinical presentation, ranging from motor deficits to altered state of consciousness. The MRI findings are not reliable to make a preliminary diagnosis. Like other lymphomas, the role of chemoradiotherapy is clearly more significant than surgical intervention in improving patient prognosis. Histopathologically, it can be Non-Hodgkin or Hodgkin, B-cell type or T-cell type and has a wide array of immunohistochemistry positivity.



1318

## Hydrocephalus

Oral presentation

The aetiological distribution of paediatric hydrocephalus in Asia: a systematic review and meta-analysis

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**Objectives:** Conduct the first systematic review and meta-analysis on the aetiological distribution of paediatric hydrocephalus in Asia.

**Background:** Understanding the aetiological distribution of hydrocephalus can inform clinical guidelines and public health decisions across Asian countries.

**Methods:** We searched Embase, MEDLINE, CENTRAL, Global Health, Global Index Medicus and Scopus with no language restriction from inception to 27th January 2023. Observational or experimental studies with paediatric data on the causes of hydrocephalus in a country within Asia were included. Only studies that did not exclude participants based on the aetiology of hydrocephalus were included. We also performed a grey literature search. The aetiology of hydrocephalus was classified as postinfectious, non-postinfectious, dysraphism and unclear; pooled proportions were calculated, and subgroup analyses performed on pre-specified moderators.

**Results:** 84 studies were included in the meta-analysis, containing data from 11359 children across 18 countries in Asia. A negative association existed between the proportion of postinfectious hydrocephalus and both human development index (-0.69 [95%CI: -1.02, -0.36],  $p < 0.0001$ ) and latitude (-0.0063 [95%CI: -0.0074, -0.0017],  $p = 0.0074$ ). Low-middle income countries had more cases of postinfectious hydrocephalus compared to high income countries (0.15 [95%CI: 0.06, 0.24],  $p = 0.0011$ ). Cultural region accounted for 24.6% of between study heterogeneity for proportion of postinfectious hydrocephalus with more postinfectious hydrocephalus in South Asia compared to East (0.19 [95%CI: 0.09, 0.29],  $p = 0.0002$ ), West (0.21 [95%CI: 0.11, 0.31],  $p < 0.0001$ ) and South-East (0.16 [95%CI: 0.007, 0.31],  $p = 0.04$ ) Asia. In addition, there were more cases of non-postinfectious hydrocephalus in East Asia compared to South (0.20 [95%CI: 0.02, 0.38],  $p = 0.029$ ) and West (0.19 [95%CI: 0.027, 0.36],  $p = 0.023$ ) Asia and more hydrocephalus secondary to dysraphism in West Asia compared to East Asia (0.18 [95%CI: 0.0068, 0.35],  $p = 0.042$ ).

**Conclusions:** Geographical and economic characteristics are associated with the aetiological distribution of paediatric hydrocephalus in Asia, with potential implications for regional guidelines on the management of paediatric hydrocephalus.

1319

## Skull Base

Oral presentation

Extended endoscopic transtuberculum transplanum approach for pituitary adenoma: an algorithmic approach to decision making

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**Objectives:** Extended Endoscopic Transtuberculum Transplanum Approach for Pituitary Adenoma: an Approach to Decision Making

**Background:** Skull base surgeons commonly use the extended endoscopic transplanum-transtuberculum approach (ETTA) for large sellar tumors with anterior and interhemispheric midline extension, mainly for resectioning craniopharyngiomas or meningiomas. The application of this approach for pituitary adenoma (PA) and the outcomes has been reported recently in limited studies. However, there is a prominent gap in the literature when it comes to decision-making.

**Methods:** We conducted a Delphi method to develop an algorithm for selecting patients suitable for the ETTA approach. A panel of 10 skull base surgeons in three rounds developed the algorithm. To validate among 1138 patients who were operated on the endoscopic transnasal approach, 81 patients were selected because they were undergone treatment with the ETTA approach. A different panel of trained skull base surgeons compared them with 81 cases of macroadenoma for whom the conventional endoscopic approach had been selected. This panel was randomly divided into two groups and inter-rater reliability was assessed. The same group was surveyed one month later with the same-set random-order patients to calculate intra-rater reliability. Analysis was done using Fleiss Kappa analysis. Highly weighted factors were charted as a decision-making algorithm.

**Results:** The mean age of patients was 45.5 years, and the average follow-up time was 39 months. In ETTA group, forty-nine patients were nonfunctional PAs. All patients had some degrees of visual loss (mean MD= -18.32) and showed some improvement in visual function, post-operatively. The average improvement in the visual field was 11.25 MD. The details were approved by panel consensus. Intra-rater kappa was 0.86 and inter-rater kappa was 0.82.

**Conclusions:** TPA algorithm Delphi method of ETTA approach has been provided acceptable reliability and may be helped less experienced surgeons to choose the correct approach. This approach is safe and effective for pituitary adenoma.



1320

## Epilepsy

ePoster presentation

### A novel surgical technique in mesial temporal lobe resection

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**Objectives:** A novel surgical technique in mesial temporal lobe resection.

**Background:** Mesial temporal lobe epilepsy (MTLE) is the most common pharmaco-resistant focal epileptic syndrome. Hippocampal sclerosis is the most commonly associated pathology with MTLE. Pharmacological options are the first-line treatment for MTLE; however, surgical approaches, such as resective surgery, stereotaxic radiosurgery, and amygdalohippocampal stimulation, have become the standard therapeutic option for patients with medically intractable temporal lobe epilepsy. The goal of the surgery is to remove the amygdala, hippocampus, and parahippocampal gyrus; therefore, the seizure-free state, considered the ultimate target of the surgery, is expected to be achieved when all of the tissue responsible for the seizure generation is removed. Besides several factors that influence the success rate of the surgery, the extent of the hippocampal resection plays an important role in surgical outcomes. Previous studies showed that in about 75% of the cases, if the anti-epileptic medications were discontinued, the seizures would occur. This suggested that the residual tissue and circuits remain could generate seizures. There is no consensus among neurosurgeons on the optimal extent of hippocampus resection.

**Methods:** We performed surgical resection of the hippocampus to the tectum level through the application of intraoperative magnetic resonance imaging, which was used for automatic navigation registration in order to achieve a greater extent of hippocampus resection.

**Results:** We demonstrated that the intraoperative magnetic resonance imaging-guided surgical resection of the hippocampus to tectum level led to excellent outcomes and a higher rate of seizure-free compared to the other surgical techniques. The incidence of complications subsequent to the procedure, such as persistent neurological deficits, intracranial hematoma, and hydrocephalus, were lower in our novel surgical technique.

**Conclusions:** Resection to the level of hippocampus tectum by means of intraoperative MRI allows a more precise extent of resection followed by a higher rate of seizure-free and lower incidence of post-operative complication.

1322

## Spine

ePoster presentation

### Mini-open lateral retropleural/retroperitoneal approaches for thoracolumbar spine chadian experience

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**Objectives:** To evaluate the management of patients who have undergone RRA in the neurosurgery department.

**Background:** The retropleural/retroperitoneal approaches (RRA) have been used to access ventrolateral lesions affecting the thoraco-lumbar spine. These approaches were recently developed at the Neurosurgery Department of Renaissance hospital (CHAD)

**Methods:** This is a prospective, descriptive study carried out in the neurosurgery department since August 2022 on all patients who have undergone RRA.

**Results:** During the study period, 13 patients were treated, a frequency of 1.44/month. The mean age of patients was 31.5 years, with extremes of 09 and 45 years. The sex ratio was 5.5. Traumatic etiology was found in 84.6% of cases. The vertebral compression fractures extended from T10 to L4, and involved the lumbar vertebra (L1) in 38.5% of cases, and a double-focus compression fracture in 1 case. Road accidents were the cause of trauma in 38.5% of cases. Five patients were Frankel A, 2 Frankel D and 1 Frankel E. Spinal CT scans were performed routinely. Intubation was selective in 1 case. The approach was lateral and retropleural after posterior arthrodesis. Vertebral cages were used in 11 cases and the iliac graft in two. Intraoperative bleeding ranged from 325 to 1000 cc, with a mean of 597 cc. Intraoperative transfusion was systematic. A post-operative scan was performed at 48 hours. The dorsal drain was removed at 48 hours, and the anterior drain 5 days after radiological control. One case of post-operative haematoma complication was reported, requiring evacuation by thoracotomy. At one month post-operatively, 2 patients were Frankel A, 6 Frankel D and 2 Frankel E. Four patients retained bladder-sphincter disorders at 3 months' follow-up.

**Conclusions:** The retropleural/retroperitoneal approaches offer easy access to the lateral spine, enabling corporectomy and reconstruction. It improves the functional prognosis of spinal trauma patients.

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## Endovascular Neurosurgery

Oral presentation

Outcomes of mechanical thrombectomy at a single-centre tertiary level public health care hospital in South Africa

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**Objectives:** We aimed to evaluate the safety and efficacy of MT in a tertiary level public hospital in Cape Town, South Africa.

**Background:** Mechanical thrombectomy (MT) is standard of care for acute ischaemic stroke from large vessel occlusion (LVO) following randomized controlled trials performed largely in high-income countries. Limited data exists on its effectiveness in the setting of low- and middle-income countries (LMIC).

**Methods:** Patients with acute ischaemic stroke presenting consecutively to Groote Schuur Hospital between 01 January 2018 to 01 January 2022 with proximal intracranial occlusion in the anterior circulation treated with MT within 6 hours from onset using CT and CTA imaging-based protocols were evaluated. Demographic, clinical, radiological, and procedural data were obtained from the stroke unit database. Recanalization was evaluated post-procedure by modified Treatment in Cerebral Infarction score (mTICI). Functional independence (modified Rankin scores (mRS) 0-2) and mortality at 90 days were also assessed.

**Results:** Thrombectomies were performed in 84 patients during the study period. The median age was 56 years (IQR) and 51% of participants were female. Median National Institute of Health Stroke Score was 18 and median baseline Alberta Stroke Programme Early CT score was 8. Bridging thrombolysis was given to 65% of participants. Median time from symptom onset to reperfusion was 339 minutes (IQR). Successful recanalization (mTICI 2b/3) was obtained in 62%. At 90 days, 34 % of participants gained functional independence and mortality was 34%.

**Conclusions:** This study demonstrated similar rates of recanalization and functional independence to that seen in trials in high-income countries using basic imaging despite a higher mortality and longer median time to reperfusion. This data supports the effectiveness of MT in a tertiary level public hospital in South Africa despite the challenges of providing emergent stroke care in a resource-constrained setting.

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## Paediatric

ePoster presentation

Cat-scratch disease (*Bartonella henselae*) with involvement of the central nervous system, a case report

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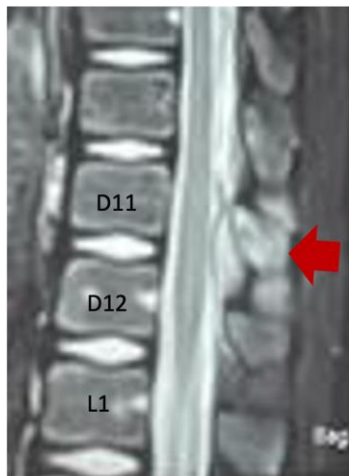
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**Objectives:** Describe the neurological symptoms presented by the patient and their evolution over time, as well as the findings of the diagnostic tests used to confirm *Bartonella henselae* infection and its involvement of the central nervous system.

**Background:** *B. Henselae* can infect the CNS and cause a variety of symptoms: fever, seizures, encephalitis and myelitis as in our case. It is important to consider this infection as a possible cause of unexplained neurological symptoms in patients with a history of contact with cats. Treatment with the aforementioned antibiotics to control this infection was adequate. *B. Henselae* infection with CNS involvement is an emerging issue in spinal pathology. Early detection and adequate treatment are essential to minimize neurological complications, as well as their chronicity.

**Methods:** Prospective descriptive study of a clinical case during the period November 2022 and March 2023 hospitalized in the Pediatric Service of the María Auxiliadora Hospital, Lima, Peru.

**Results:** We present the case of a pediatric patient with prolonged fever and lower limb motor impairment secondary to cat-scratch disease. Serological tests for *Bartonella henselae* were positive and it was also evidenced in the imaging. The dorso-lumbar MRI shows focal hyperintensity in the posterior arch D11 and D12, compatible with osteomyelitis (red arrow). In addition, it shows an image compatible with myelitis at D11 and D12, and perivertebral soft tissue and foramina involvement (blue arrow). The patient was treated with Rifampicin and Clindamycin for 40 days, and his neurological condition improved after four days of treatment.



**Conclusions:** *B. Henselae* infection with involvement of the central nervous system is an emerging topic in medicine. Early detection and proper treatment are essential to minimize neurological complications.

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## Spine

Oral presentation

### Safety, sequelae, and efficacy of nerve root clipping in patients with spontaneous spinal CSF leaks

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**Objectives:** This study aimed to analyze the risk profile and efficacy of nerve root clipping in patients with Type II and Type III spinal CSF leaks.

**Background:** Spinal CSF leaks may cause a myriad of clinical symptoms, the most common being orthostatic headache. Leaking cysts (Type II) and direct CSF venous fistulas (Type III) are a subgroup of spinal CSF leaks representing about 1/3 of spinal CSF leaks. To seal the diverticula or the CSF venous fistula the respective nerve root is microsurgically ligated using aneurysm clips.

**Methods:** All consecutive patients with Type II and Type III spinal CSF leaks treated with nerve root clipping at our Neurosurgical institution from Mai 2018 to November 2022 were included. Patients were evaluated for post-operative sensory-motor deficits. The incidence of neuropathic pain was assessed via the DN4 (Douleur Neuropathique 4) and patient-reported outcomes (PROMs) were evaluated via the PGIC (Patient Global Impression of Change).

**Results:** A total of 40 patients were included in the study (Type II n=31; Type III n=9). In total, 47 spinal CSF leaks were treated via nerve root clipping; the mean age was 46,6 years. The mean follow-up time was 22 months. Significant improvement of symptoms according to the PGIC was reported in 98% of patients. 87.8% of patients either fully or partially returned to their employment. One patient experienced a low-grade interosseous motor deficit after T1-nerve root clipping. 7.5% of patients developed post-operative neuropathic pain, one patient required medical treatment under which fully recovery was made. Over 80% of patients developed dermatomal hypoesthesia, with no reported effect on life quality.

**Conclusions:** The surgical strategy of non-eloquent nerve root clipping has favorable overall outcomes and return to work rates. There are instances of neuropathic pain and dermatomal hypoesthesia with no significant morbidity. Further improvement in surgical strategy is needed for eloquent nerve roots.

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## Global Neurosurgery

ePoster presentation

### Chronic subdural haematoma associated with pre-eclampsia case report

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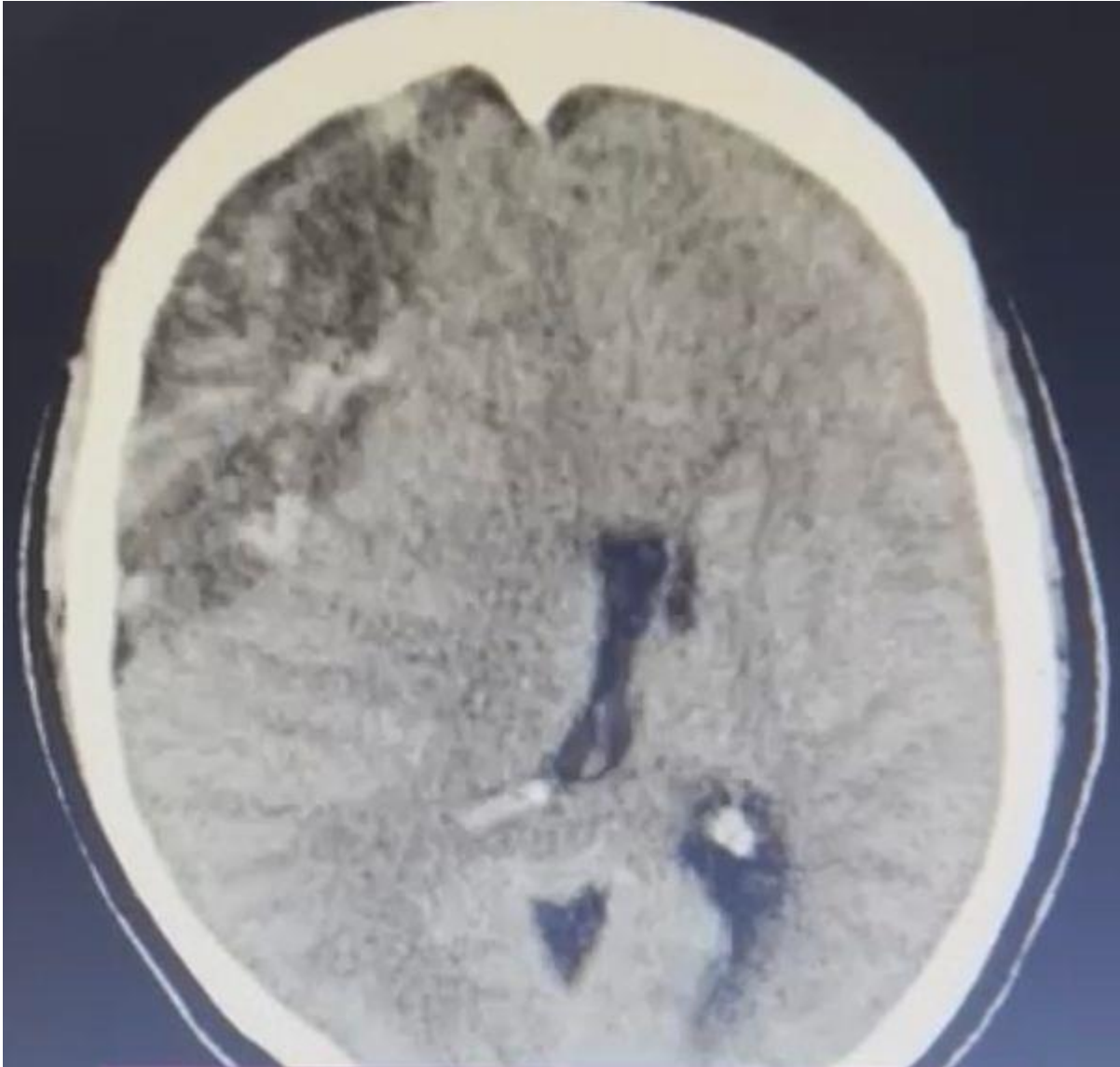
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**Objectives:** To emphasize the rarity of the association between pre-eclampsia and spontaneous chronic subdural hematoma

To discuss the potential underlying mechanisms linking pre-eclampsia and the development of chronic subdural hematoma during puerperium.

**Background:** Chronic subdural hematoma is a known complication of head trauma or coagulopathy. However, its association with pre-eclampsia, in the absence of clotting factor abnormalities and history of trauma, is exceedingly rare. This report aims to highlight the potential relationship between pre-eclampsia and the development of chronic subdural hematoma, emphasizing the importance of early recognition and appropriate management.

**Methods:** A 30-year-old puerperal patient on her first postoperative day of cesarean section for severe pre-eclampsia presented with altered consciousness and high blood pressure. Physical examination revealed a GCS 8, anisocoria and left leg paresis. Computed tomography scan of the brain demonstrated a chronic subdural hematoma with midline shift. Based on the clinical presentation and neuroimaging findings, a diagnosis of chronic subdural hematoma associated with pre-eclampsia was made. Coagulation profile and platelet count were within the normal range, ruling out coagulopathy as a contributing factor. Other potential causes of chronic subdural hematoma, such as head trauma or underlying bleeding disorders, were excluded.



**Results:** Given the severity of symptoms and the risk of worsening neurological compromise, surgical intervention was deemed necessary. The patient underwent parietal craniotomy with evacuation of the hematoma. The patient's condition improved gradually. Following surgery and appropriate management of pre-eclampsia, the patient experienced a complete resolution of symptoms and showed no neurological deficits.

**Conclusions:** This case report highlights the association between pre-eclampsia and the development of spontaneous chronic subdural hematoma during puerperium. Clinicians should be aware of this rare but potentially serious complication for appropriate diagnostic and prompt surgical intervention.

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## Trauma

ePoster presentation

Prognosticating TBI through serum albumin and radiomic characteristics of brain CT scan on admission: a machine learning model

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**Objectives:** To develop a clinical and radiological model of Machine Learning (ML) which is capable of automatically learning and recognizing radiomic patterns from brain CT scan and correlating them with serum albumin for prediction of overall outcome after TBI.

**Background:** TBI represents one of the major causes of disability. Several biomarkers and imaging signs have been yet investigated in order to predict patient's outcome. In particular, admission serum albumin shows high sensitivity in predicting overall outcomes after TBI. Nowadays, radiomics unveils plenty of informations from medical images and artificial intelligence is rapidly emerging toward a personalized medicine. The objective of this study is to evaluate the relationship between admission serum albumin and radiomic data on brain CT scan through ML, by the use of algorithms to automatically learn and recognize patterns from admission brain CT scan. Thus, a ML clinical and radiological model for prediction of overall outcome after TBI will be developed.

**Methods:** Admission brain CT scan and serum albumin of patients admitted for mild to severe TBI, at ARNAS Civico Palermo, were reviewed. Clinical data and patient's outcome were recorded. Brain CT scan were post-processed and analyzed in order to build a radiomic model using support vector machine (SVM).

**Results:** According to this model, it has been possible to evaluate the radiomic characteristics of brain CT scan and to correlate them to serum albumin on patient's hospital admission after TBI.

**Conclusions:** This pipeline analysis show that the combined ML model of radiomic analysis of brain CT scan and assessment of serum albumin on admission outperforms the prognosticating capability of the sole clinical or radiological evaluation after TBI. Radiomic can be a helpful tool for the evaluation of patient's overall prognosis after TBI since hospitalization, specially in an HUB and spoke setting.



## Hydrocephalus

Oral presentation

Optic nerve sheath diameter distension in normal pressure hydrocephalus: a potential marker for shunt responsiveness

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**Objectives:** This study investigates the prevalence of optic nerve sheath diameter (ONSD) distension in Normal Pressure Hydrocephalus (NPH) and its utility in the identification of shunt-responsive NPH patients.

**Background:** ONSD is a useful noninvasive marker for the identification of patients with abnormal cerebrospinal fluid (CSF) dynamics both in emergency and elective setting. Studies employing ultrasound and MRI techniques have confirmed the association between ONSD distension and raised ICP, however its association with NPH has not been described before.

**Methods:** Retrospective single-centre study. Patients admitted for extended lumbar drainage (LD) for suspected NPH since January 2020 were identified. Inclusion criteria were (a) complete recording of pre- and post-LD walking test results; (b) brain MRI performed before treatment with ventriculoperitoneal shunt. Patients with 10% improvement in their post-LD walking test were considered shunt 'responders'. ONSD was measured on axial T2 MRI sequences and considered abnormal or distended if >2mm in thickness in the area immediately behind the globe. Data on walking test results and ONSD were collected by independent assessors.

**Results:** Thirty-three patients (19M, 14F, mean age 74±8 years) met the inclusion criteria. Twelve patients (36%) had ONSD distension. Based on the post-LD walking test, 26 patients (79%) were classified as 'responders' and 7 patients (21%) were 'non-responders'. 'Responders' had an average walking speed improvement of 26%. Amongst the 'responders', 38.5% had distension of the ONSD (sensitivity), while 71% of the 'non-responders' had normal ONSD (specificity). The patients with distended ONSD were classified as responders in 83% of the cases (positive predictive value).

**Conclusions:** These results suggest that despite having a 'normal pressure', NPH patients often have distension of the ONSD. In addition, this sign could be a useful non-invasive marker for the detection of shunt responsiveness. Larger studies will be needed to confirm these findings.

## Global Neurosurgery

ePoster presentation

### Evaluating apnea test safety during clinical diagnosis of brain death in adults

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**Objectives:** The aim of this study was to investigate safety of apnea test and its impact on hemodynamic, respiratory and metabolic status.

**Background:** Apnoea test is part of brain death (BD) determination protocol. Literature on its clinical impact is limited and concerns exist related to its potential adverse effects.

**Methods:** Single-center retrospective analysis of patients undergoing BD determination from January 2019 to October 2022 at University hospital in Messina, Italy; Two apnoea tests performed 6 hrs apart (target PaCO<sub>2</sub> > 60 mmHg, pH < 7.35) are required by Italian law during BD diagnosis. CPAP mode ventilation was used during apnea test. Arterial blood gases (ABG) were collected before, during and at the end of apnea test, and invasive blood pressure monitoring. MAP (or Noradrenaline infusion rate), ABG, serum lactate blood levels, heart rate before apnea test and at the end using paired T-test were recorded. The association between SAPS II and MAP or vasopressors rate changes during apnoea test were recorded.

**Results:** Fifty-seven adult patients were studied between 2019 and 2022. There was no significant change in serum lactate and mean arterial pressure between pre- and post-apnoea test values both first and second test. There were significant changes in heart rate during the first test (86.7 ± 18.77 bpm vs 90.63 ± 20.51 bpm – P=0.023), P/F value in both (259.8 ± 132.03 vs 201.57 ± 153.37 – P=0.023 and 327.35 ± 243.25 vs 211.58 ± 141.01, P=0.0017), NORadrenaline infusion rate (0.2 ± 0.2 vs 0.35 ± 0.24 microg/kg/min P=0.0001). No association was seen between SAPS II and MAP or noradrenaline rate changes. Significant changes in P/F value levels were detected without hypoxemia. One case of arrhythmia, and 3 cases of hypotension requiring vasopressor were recorded.

**Conclusions:** Although apnoea test is not free of effects on systemic homeostasis, we have not found significant clinical changes in our patient population.

## Oncology

ePoster presentation

### Thoracic schwannoma with NOONAN syndrom: case report and literature review

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**Objectives:** We present a rare case of thoracic schwannoma associated with this syndrome.

**Background:** NOONAN syndrome (NS) is a very rare autosomal dominant genetic disorder, with an incidence of 1/2,000 births, characterized by a polymalformative syndrome with prominent facial dysmorphism, congenital heart disease and short stature, associated with psychomotor retardation and tumor predisposition. In recent years, numerous studies have described the association of NS with Neurofibromatosis type 1 (NF1) as a clinical entity known as Neurofibromatosis-NOONAN syndrome (NFNS). The disease results in several tumors of the nervous system.

**Methods:** A 27-year-old male was admitted in our Department

**Results:** A 27-year-old male followed for NS, was admitted in our Department, complaining of chronic back pain radiating into thoracic supra umbilical hemi-belt associated with paresthesias for 2 years. Clinically, he had intercostal neuralgia with a dorsal spinal syndrome. A spinal cord Magnetic Resonance Imaging (MRI) showed a paravertebral mass of D8, on the right with regular, well-limited contours, exerting anterior scalloping on the pleura, laterally invading the posterior arch and medially enlarging the foramen with the onset of intracanal extension, creating an hourglass appearance.

With the thoracic surgery team, he underwent posterolateral thoracotomy of the 8th intercostal space, overlooking the costovertebral joint, for a one-piece removal tumor with no dural attachment. Preceded by tumor dissection using bipolar cautery, until the root of the 8th intercostal nerve was identified below, its efferent part lateral to the tumor, the dura mater medially and the afferent part ventrally. The nerve was then ligated. Histological appearance and immunohistochemical profile were consistent with schwannoma. Postoperative course was favorable, with regression of his intercostal neuralgia.

**Conclusions:** The occurrence of a schwannoma in a patient with NOONAN syndrome is exceptional and very rarely described. However, the NFNS entity could explain this by the predisposition of patients with Neurofibromatosis to develop benign schwannoma-like tumors.

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## Paediatric

ePoster presentation

### Subdural collection versus Benign enlargement of subarachnoid space in childhood: diagnostic challenges in the emergency department - a case report

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**Objectives:** To report a rare case of benign enlargement of the subarachnoid spaces.

**Background:** A 5-month-old male patient presented with progressive behavioral changes, drowsiness, and a fall from a transport cart 72 hours prior to admission. On examination, he appeared lethargic, with a normotensive fontanelle, right lower limb paresis, and a distended bladder. Cranial computed tomography revealed bilateral subdural collection without midline shift and a contusion of the precentral gyrus. After 48 hours, there was neurological improvement, and the motor and urinary symptoms were attributed to the contusion in the motor cortical area. After 20 days, the patient presented with cognitive decline and an increased collection. Surgical treatment was performed with subdural-to-peritoneal shunting. The patient showed clinical improvement, slight reduction in volume, but the benign collection persisted.

**Methods:** Case report of a patient hospitalized in a reference center in the metropolitan region of Curitiba in 2023, along with a literature review.

**Results:** One of the pathophysiological hypotheses for benign enlargement of the subarachnoid spaces (BESS) is the delayed maturation of arachnoid villi, resulting in defective cerebrospinal fluid absorption and subsequent accumulation. It is more prevalent in males and spontaneously resolves by 2 years of age. Although it has a benign nature, there is an increased risk of subdural hemorrhage following low-energy trauma. They commonly flatten the underlying gyri, exhibit products of blood degradation on magnetic resonance imaging, and do not show the presence of the cortical vein sign. In the reported case, there was no flattening of the underlying gyri.

**Conclusions:** BESS and subdural collections in childhood have distinct pathophysiologies. Differentiating them in the emergency setting is a challenge. Additionally, it is important to be vigilant for the observation of BESS after even low-energy traumas, as they can more easily progress to hemorrhages.

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## Neurovascular Surgery

ePoster presentation

Neurocardiogenic stress cardiomyopathy in patients with subarachnoid haemorrhage. Pilot study in Italian Piedmont area

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**Objectives:** Our hypothesis is that there are predictive factors that might explain the different susceptibility to the cardiac complications after SAH. The aim of our study was to evaluate the occurrence of cardiac dysfunction after SAH and the association with outcome.

**Background:** Acute neurocardiogenic injury is a relevant complication occurring after subarachnoid hemorrhage and may worsen outcome.

**Methods:** Adult SAH patients (WFNS IV-V) admitted to ICU were enrolled. Exclusion criteria: admission >48hrs, previous myocardial infarction, prior LVEF<40%, pregnancy. Alterations in myocardial necrosis markers, ECG and WMA were evaluated daily during the first 5 days. We studied the cerebral areas involved by the SAH at neuroimaging and we performed genetic analysis to determine allelic variances of 4 genes that are potentially implicated in cardiomyocyte susceptibility to catecholamine toxicity: Catechol-O-methyl Transferase (COMT) rs4680, Nitric Oxide Endothelial Synthase (eNOS) rs20707144,  $\beta$ 2 adrenergic receptor (ADRB2) rs1042713, ADRB2 rs1042714.

**Results:** Fifty-five patients were enrolled, mean age 61.5 +/-11.5 yrs, 76% female. Sixty-nine percent of patients were treated endovascularly, 25.5% surgically. Median Admission GCS was 6 (IQR3-9), median WFNS score 5 (IQR 4-5), median SAPSII 48 (IQR 39-54). Fifty-five percent of patients had elevated troponin, 96% had ECG alterations, 25% of patients had wall motion abnormalities. Troponin levels and echocardiogram abnormalities improved during the first week 5 days of admission. The insular and cingulate cortex were the most frequently involved. Genetic analysis was performed in 25 patients. The AA genotype of COMT rs4680 polymorphism was more common in patients with WMA (p=0.042). TT genotype of eNOS rs20707144 was more common in patients with ECG abnormalities. The AA genotype of polymorphism ADRB2 rs1042713 was more common in patients with WMA.

**Conclusions:** There was an elevated frequency of cardiac abnormalities. Association with outcome was not significant in our population.

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## Neurovascular Surgery

ePoster presentation

A variation to consider in posterior occipital surgical approaches: dominant occipital sinus

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**Objectives:** We describe a change of approach due to a very rare variation of the dominant occipital sinus (OS) in a 22-year-old female patient who was scheduled for posterior occipital surgical approach due to Chiari type 1 malformation.

**Background:** A thorough assessment of the venous sinus anatomy is of paramount importance in surgical planning, especially in cases where the approach lies in the vicinity or requires sacrifice of the sinus.

**Methods:** A 22-year-old female patient presented with complaints of pain and numbness in both arms and neck. MRI scans revealed that the cerebellar tonsils herniated approximately 10 mm in the foramen magnum and there was extensive syringomyelia between C1 and T1. Posterior occipital craniectomy and duraplasty were planned for the patient with the diagnosis of Chiari Type 1 malformation. Venous sinus anatomy appeared unusual, and thus magnetic resonance venography was performed, which identified the OS as the main drainage pathway for the entire brain, providing the sole drainage between the superior sagittal sinus and the jugular veins through the marginal sinus. Both the transverse and sigmoid sinuses were hypoplastic, and flow through the straight sinus was diminished. The dural opening was tailored so as not to damage the OS and marginal sinus.

**Results:** In the postoperative follow-up, patient's preoperative complaints regressed and she was followed up as neurologically stable. The patient, who reapplied with headache on the 10th day, was scanned with MR venography and it was confirmed that the flow of the occipital sinus was preserved. A prophylactic anticoagulant therapy started to prevent further complications.



**Conclusions:** Rare variations of the venous/sinus anatomy may fundamentally change the surgical management plan, and recognizing such variations is crucial to minimizing the risk of potentially fatal complications.

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## Spine

ePoster presentation

### Extradural thoracic spine lesion due to methotrexate in a Rheumatoid Arthritis patient

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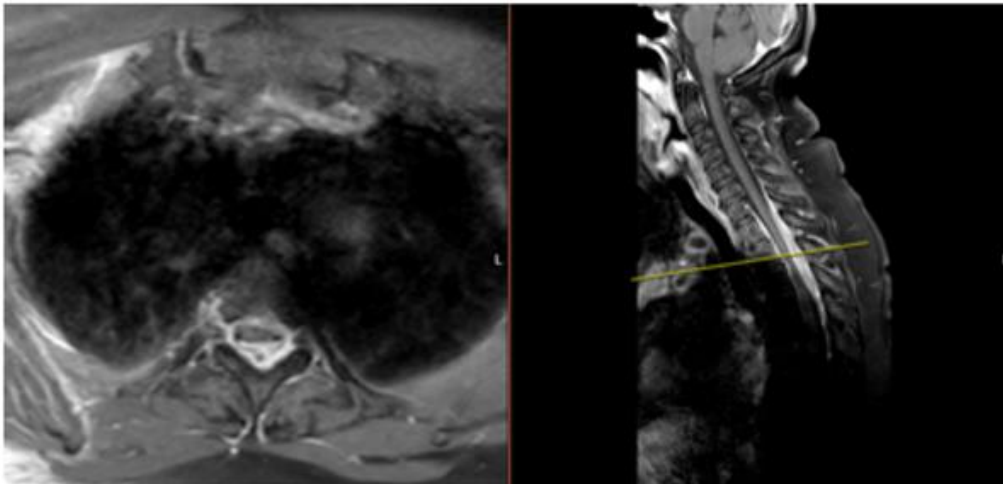
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**Objectives:** Rheumatoid arthritis (RA) is commonly known with atlantoaxial subluxation regarding spinal involvement. As a rare spinal pathology of RA, our case presents with thoracic extradural extramedullary lesion.

**Background:** Rheumatoid arthritis shows chronic inflammation of the synovium of perivertebral ligaments which is an immunologically induced phenomenon. The chronic inflammation of the synovium forms granulation tissue that invades peripheral joints towards the center and causes ligament cartilage damage. Although cervical spine involvement of RA is well documented, data on thoracic spine involvement and surgical management remains limited. A rare case of rheumatoid nodules presented involving thoracic spinal cord compression in the setting of extradural rheumatoid nodule formation. Kerstens et al. demonstrated that this sort of extra-articular nodule formation may be accelerated by the use of methotrexate.

**Methods:** In our case; 52 year-old woman under treatment methotrexate and adalimumab for RA was presented with back pain to our clinic. There were no neurologic deficit or symptom rather than the pain. PET/CT showed increased F18-FDG activity in the thoracic spine. MRI images with contrast showed diffuse contrast enhancement in dura posteriorly between C6-T5 vertebral body. Surgical decompression of thoracic spine was performed with laminectomy and excision of extradural lesion. Posterior segmental instrumentation of C7 and T1 vertebrae was applied for the fixation. 3D printed intraoperative personalized guide was used for screw placement.



**Results:** Pathology specimen resulted as acute and chronic inflammation considered to be the result of inflammatory response of RA or use of methotrexate.

**Conclusions:** Although the involvement of RA in the cervical spine has been well reported and studied, there are few reports of disease manifestation and best treatment practices for the thoracic spine.



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## Global Neurosurgery

Oral presentation

A comparative analysis of outcomes following cranioplasty with autologous bone, titanium mesh, and polymethyl methacrylate in Durban, South Africa

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**Objectives:** To compare the outcomes of cranioplasty using autologous bone (AB), titanium mesh (TM), or polymethyl methacrylate (PMMA). The primary objectives were to assess the overall complication rate, revision rate, and postoperative length of stay (LOS) associated with these materials.

**Background:** Cranioplasty is a common reconstructive procedure performed to repair skull defects. There is currently no consensus regarding the optimal material for cranioplasty following craniectomy procedures.

**Methods:** A retrospective chart review was conducted on ninety six patients (n=96) who underwent a cranioplasty procedure between 2017 and 2023 at Inkosi Albert Luthuli Central Hospital (IALCH). Patients were categorised into three groups according to materials used, AB (n=41), TM (n=33), and PMMA (n=22). Demographics, clinical characteristics, postoperative complications and length of stay (LOS) were analysed.

**Results:** The indications for craniectomy were traumatic brain injury (81,25%), intracranial sepsis (10,42%), tumours (7,29%), and stroke (1,04%). Cranioplasty with AB had the highest complication rate (44%), followed by PMMA (32%) and TM (24%). AB had a 12,19% implant failure rate compared to TM and PMMA which had implant failure rates of 6,06% and 4,55% respectively. Post-operative implant-related collections were reported in 9,76% AB, 6,06% TM and 18,18% PMMA. The PMMA group had a 13,64% infective complication rate compared to AB and TM which had no infective complications. The overall revision rate was 9,76% in AB compared to 3,03% TM and 13,64% PMMA. The average LOS (days) was 10,82 in AB compared to 8,06 TM and 7,95 PMMA.

**Conclusions:** AB had the highest complication rate, followed by polymethyl methacrylate and titanium mesh. Complications post-cranioplasty resulted in a prolonged LOHS. Selection of material used for cranioplasty should be individualised, especially in resource constrained environments to improve outcomes and prevent complications.

## Endovascular Neurosurgery

ePoster presentation

### Endovascular treatment of carotid-cavernous fistula: a case series and literature review

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**Objectives:** To report two cases of cavernous sinus syndrome caused by carotid cavernous fistula.

**Background:** Case 1: A 18-year-old male presented with proptosis, hyperemia, and loss of extraocular muscle movement in the right eye, along with reduced visual acuity, following a motorbike-truck collision causing traumatic brain injury. Cerebral angiography revealed a high-flow direct carotid cavernous fistula (CCF). Case 2: A 40-year-old female presented with right-sided retro-orbital frontal headache persisting for 30 days, accompanied by periorbital edema, hyperemia, and ocular proptosis. Cerebral angiography showed a right cavernous internal carotid artery (ICA) saccular aneurysm associated with a high-flow indirect CCF. Both patients underwent embolization and showed progressive symptom recovery.

**Methods:** Report of two cases of patients hospitalized in a quaternary hospital in 2022, along with a literature review.

**Results:** Cavernous sinus syndrome (CSS) occurs due to involvement of the "cavernous portion" of the ICA, cranial nerves III, IV, and VI, and branches V1 and V2. The most common causes of CSS are inflammatory processes, followed by tumors, aneurysms, and CCFs, which were the etiology in the two reported cases. CCF is an abnormal communication between the carotid system and the cavernous sinus, which can occur spontaneously in 25% of cases or after craniofacial trauma in 75% of cases. According to Barrow's classification, CCFs can be direct, with direct communication between the cavernous sinus and the ICA, or indirect, when the connection occurs through dural branches of the ICA or external carotid artery, or both. Clinically, CCF can be characterized by Dandy's triad: proptosis, pulsatile bruit, and conjunctival hyperemia.

**Conclusions:** Early diagnosis and treatment of this condition are crucial, both due to its severity and to prevent visual complications. Definitive diagnosis is made by cerebral angiography. Endovascular treatment is the gold standard, although surgery may be necessary in some cases.

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## Spine

ePoster presentation

### Adjacent segment pseudomeningocele formation: a case report

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**Objectives:** We describe pseudomeningocele formation at the level of adjacent segment due to prior posterior segmental instrumentation surgery in a 62 years old female patient.

**Background:** A 62-years-old female patient presented with complaints of pain and numbness in both lower extremities mostly on the right side. MRI scans revealed that lumbar stenosis is present neighboring the instruments implanted 20 years ago. Removing the instrumentation, performing decompressive laminectomy at the adjacent segment level then implanting new instruments two levels upwards than former implantations. Peroperatively novel pseudomeningocele formation discovered at the adjacent segment level.

**Methods:** Decompressive laminectomy was performed at the adjacent level carefully and L4-L5-S1 implants removed. After that new implants placed from L1 to S1 and pseudomeningocele was secured during the process.

**Results:** Patient discharged with pain relief and no additional motor deficits.



**Conclusions:** Pseudomeningocele formation is a rare late complication in lumbar stenosis surgery and may fundamentally change the surgical management plan, and recognizing such variations is crucial to minimizing the risk of potential complications.

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## Spine

ePoster presentation

Clinical outcome of patients with individualized 3D printing assisted C1-C2 fusion

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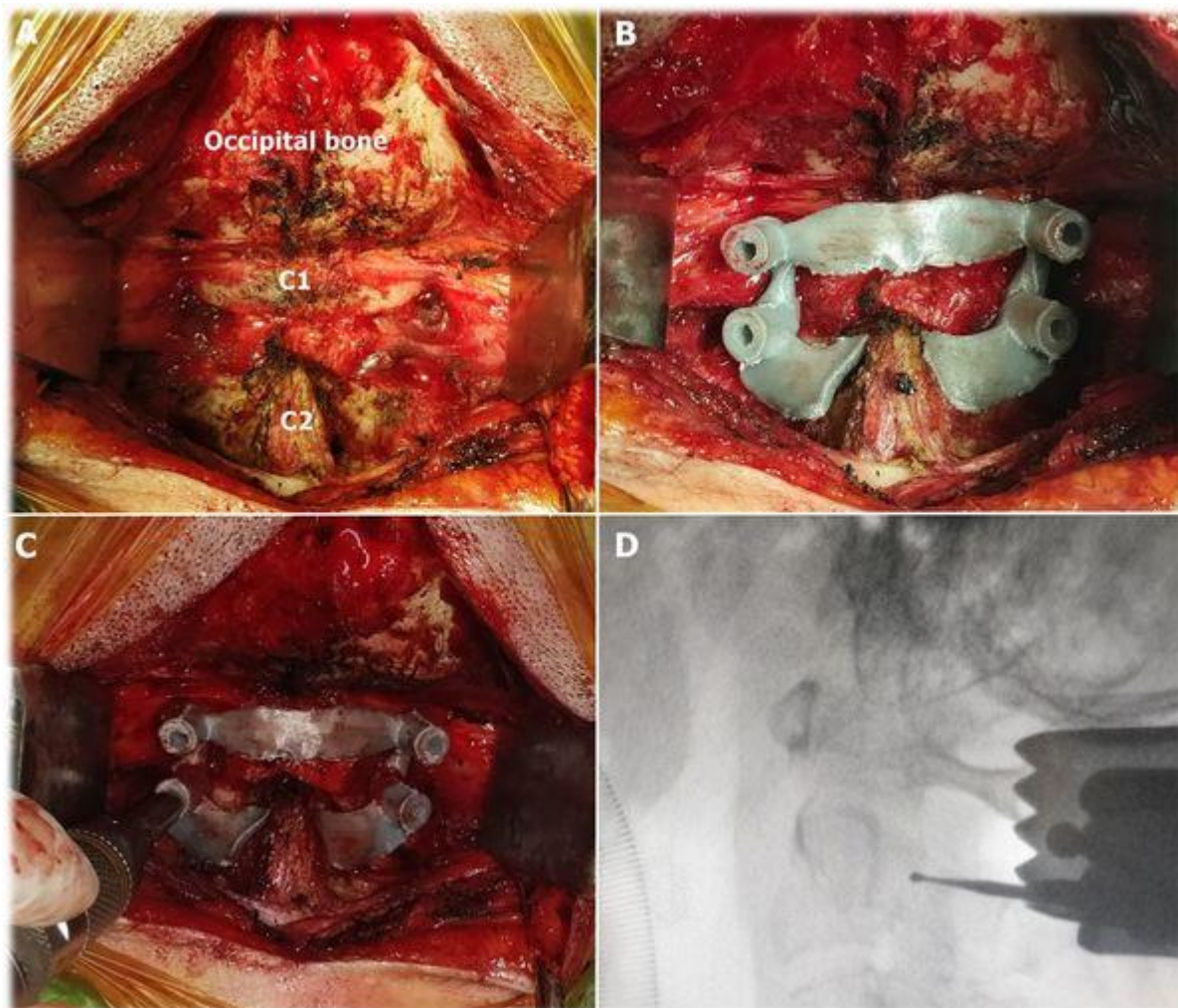
**Objectives:** The aim of this study is to investigate the effect of surgical planning and application on clinical results on preoperative models created with a 3D printer of patients who will undergo posterior C1 – C2 fusion using C1 lateral mass - C2 pedicle screwing.

**Background:** At the cervical atlantoaxial joint; Atlantoaxial instability may develop as a result of trauma, congenital deformity, tumor, infection or rheumatological degeneration. Atlantoaxial instability should be treated as it causes serious complications such as neurological dysfunction, respiratory distress, and even sudden death.

**Methods:** 21 patients admitted to our clinic with atlantoaxial instability were included in this study. A three-dimensional printer, a specially designed additive manufacturing technology, was used for the production of three-dimensional printing material. Surgical planning was done and applied on preoperative models. All data were evaluated with IBM SPSS Statistics v.29.

**Results:** The mean age of the patients was  $52.54 \pm 20.45$  years (24-75). Of 21 patients, 12 (57.1%) were male and 9 (42.9%) were female. Of these patients, 6 (28.6%) were admitted to our clinic due to congenital anomaly, 13 (61.9%) due to trauma, 2 (9.5%) due to tumor. The mean operation time of the patients was  $258.66 \pm 64.86$  minutes. Isolated C1-C2 fixation was applied to 14 (66.7%) patients, and C1-C2 and lower or upper fixation was applied to 7 (33.3%) patients. The mean preoperative atlantodental interval was  $3.77 \pm 2.81$  mm, and the postoperative atlantodental interval was  $1.84 \pm 1.06$  mm. The mean preoperative cervicomedullary angle was  $148.09 \pm 11.78$  degrees, and the postoperative cervicomedullary angle was  $145.00 \pm 13.62$  degrees.





**Conclusions:** The use of these models offers advantages to surgeons by increasing the ability to simulate preoperatively. The 3D modeling technique reduces screw malposition during surgery, shortens the operation time and increases intraoperative safety.

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## Spine

ePoster presentation

### Clinical outcomes of 3D printing asissted guide for complex cervical spine surgery

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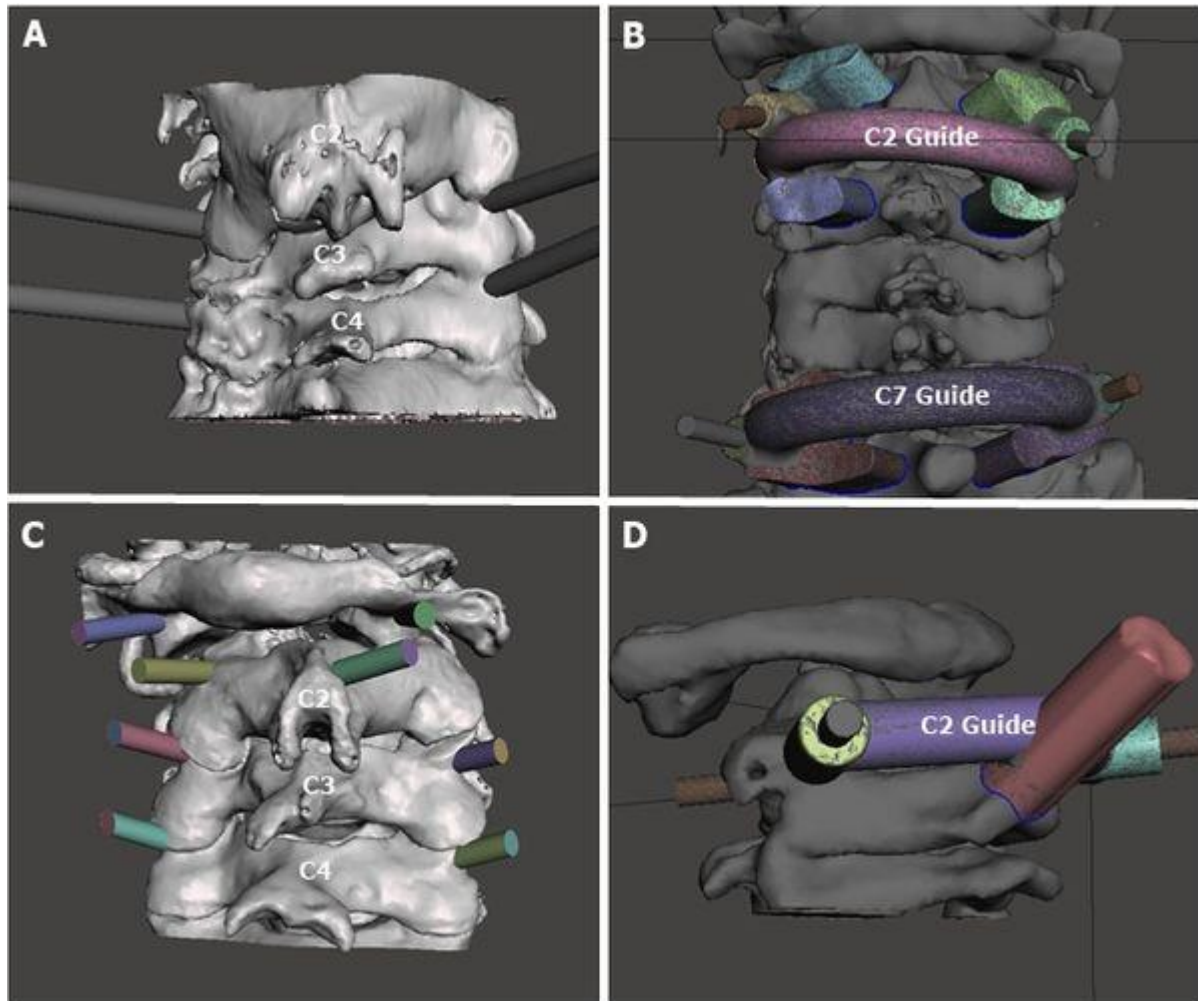
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**Objectives:** Three dimensional (3D) printed models specific to the patients, decrease peroperative complications by providing preoperative surgical planning and application opportunities to the surgeon.

**Background:** The aim of this study is to determine the clinical results of preoperative surgical planning and application on 3D printed models, in patients with cervical vertebra pathologies treated via pedicle screw and posterior spinal fusion.

**Methods:** 16 patients in total from our clinic were included to this study. The CT images of cervical vertebra were evaluated and uploaded to the software (Mimics v14, Materialize Corp, Belgium). Models were printed using a 3D printer (Ultimaker 2, Ultimaker B.V., Utrecht). Preoperative surgical planning and application were performed on the models. All data were evaluated with IBM SPSS Statistics v.29.

**Results:** The mean age of the patients was 55.50±11.09 years (38-77). 9 (56.3%) patient were male and 7 (43.8%) were female. Of these patients, 9(56.3%) were admitted to our clinic due to cervical spondylotic myelopathy, 3(18.8%) due to fracture, 2 (12.5 %) due to cervical neoplazm, 1 (6.3%) due to atlantoaxial dislocation and 1(6.3%) due to thoracic neoplazm. The mean operation time was 252.62 ±53.46 minutes. 3 patients who admitted with fractures ASIA impairment score were recorded. 2 (66.7%) were grade E and rest was grade D (33.3%), 9 patients who admitted with cervical spondylotic myelopathy Nurick grades were recorded. 9 (56.3%) was grade 1, 6 (37.5%) were grade 2, 1 (6.3%) was grade 5. 11 patients have neurological deficit before surgery (68.8%). After surgery 7 patients achieved clinical improvement (43.8%), 1 patients neurological findings were deteriorated(6.3%), rest of patients clinical findings were still remained.(50%). 3(18.8%) of patients have screw malposition.



**Conclusions:** Use of the 3D models increases the ability of preoperative simulation of the surgeon. This technique decreases the risk of screw malposition and shortens the operative duration.



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## Spine

Oral presentation

### Individualized 3-Dimensional guide for cervicothoracic junction pedicle screw placement

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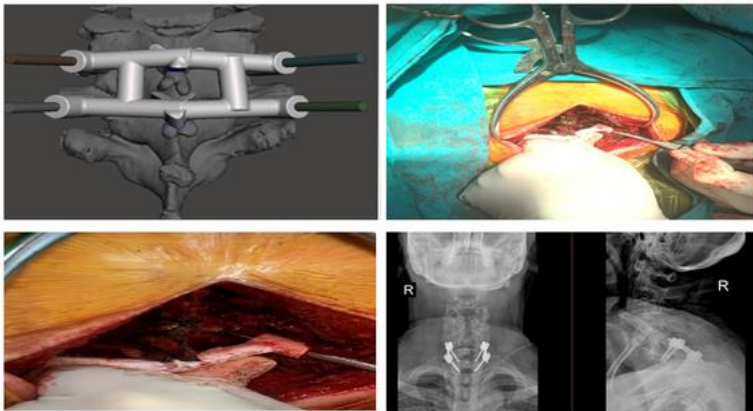
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**Objectives:** The aim of this study is to increase the quality of surgical planning and surgeon's orientation using individualized 3D models for cervicothoracic spine pedicle screw placement.

**Background:** Preoperative evaluation of structure of the spine has importance for define the cervicothoracic spine pedicle screw entrance point and trajectory. This relationship can be shown in 3D with personalized models using a 3D printer.

**Methods:** Individualized models were prepared with a 3D printer preoperatively for a total of 7 patients. The CT images of column were evaluated and uploaded to the software (Mimics v14, Materialize Corp, Belgium). Models were printed using a 3D printer (Ultimaker 2, Ultimaker B.V., Utrecht). The models were sterilized and used for intraoperative examination by the surgeons. The accuracy of pedicle screws and related complications (blood loss ,screw malposition ,neural injury,dural tear) were recorded. All data were evaluated with IBM SPSS Statistics v.29.



**Results:** The mean age of the patients was 59.28±15.16 years (34-77). Of 7 patients, 3 (42.9%) were male and 4 (57.1%) were female. Of these patients, 3 (42.9%) were admitted to our clinic due to fracture 2 (28.6%) due to cervical neoplasm, 1 (14.3%) due to cervical spondylotic myelopathy and 1(14.3%) due to thoracic neoplasm. The mean operation time was 207.14 ±31.99 minutes. 3 (42.9) of patients preoperatif deficits have been decreased after operation,the rest were still remained (57.1%). 2 (28.6) of patients were expired after operation.

**Conclusions:** Individualized 3D models are safe and can be use for avoid complications as malposition of screws. This models allows for more accurate placement of pedicle screws at the cervicothoracic joint and have a positive impact on the surgery.

## Global Neurosurgery

ePoster presentation

### History of neurosurgery in a West African Country, Cote D'Ivoire

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**Objectives:** To provide a history of neurosurgery in Cote d'Ivoire.

**Background:** Modern neurosurgery was introduced and started to develop in African countries from 1951. In Côte d'Ivoire, the first service of neurosurgery opened his door in 1989 but there is no data in the literature tracing the history of neurosurgery.

**Methods:** Retro-prospective cross-sectional study with a descriptive aim of the evolution of neurosurgery in Côte d'Ivoire from the first practices to the present day, based on a survey, a literature review and interviews.

**Results:** Four periods were identified. The first, which began in 1972, is identified with Doctor Mélaïne Kouamé KANGAH, the first neurosurgeon. Craniocerebral traumatic pathology and meningiomas were then treated. The second period extended from the opening of the Neurosurgery Department of Yopougon in Abidjan in 1990 until 1998. Professors Jean Jacques SANTINI, Vincent BA ZEZE, « father » of Ivorian neurosurgery, Gilbert DECHAMBENOIT and Guy VARLET marked this period which saw the development of Ivorian neurosurgery. Then the third period of stagnation, until 2012, which however saw the diversification of skills, the opening of the Diploma of Specialized Studies in 2007, the creation of a pediatric unit in 2008, and the Ivorian Society of Neurosurgery in 2009. The fourth period was characterised by the resumption of progress in terms of human and material resources, with the opening of the Bouaké and Yamoussoukro services, and the development of private practice. But much remains to be done in terms of equipment and training.

**Conclusions:** Notable progress has been made in this study. The prospects are summarised in the project to create an institute of neuroscience and other neurosurgery services in the major regions of the country.

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## Hydrocephalus

ePoster presentation

A rare case of Ventriculoperitoneal Shunt (VPS) end catheter thorax migration in an infant patient with diaphragmatic congenital defect

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**Objectives:** To demonstrate a surgical approach to hydrocephalus caused by a rare occurrence of VPS thorax displacement in a patient with a diaphragmatic congenital defect based on a case report and literature review.

**Background:** Hydrocephalus caused by VPS malfunction is a common complication in the pediatric population, and catheter displacement through migration accounts for approximately 8-10% of cases. However, there are rare reports in the literature regarding VPS End Catheter Thorax Migration, which presents a challenge for a safer surgical approach due to the high morbidity associated with the risk of peritonitis, meningitis and secondary hydrocephalus.

**Methods:** This study includes a literature review of medical management in patients with hydrocephalus due to VPS malfunction by thorax migration along with a case report for illustrative purposes.

**Results:** A 2-year-old male infant diagnosed with neonatal hydrocephalus due to meningitis, treated with a VPS, presented to the emergency department with antibiotic-resistant bronchopneumonia, signs of intracranial hypertension, and VPS valve malfunction. A Head and Thorax CT scan revealed hypertensive hydrocephalus, with the distal shunt tube involved in multiple cysts and consolidations in the left thoracic base. A laparotomy was performed, and the distal catheter was observed crossing the falciform ligament of the liver, entering the thoracic cavity through a diaphragmatic malformation. The shunt tube was removed under direct visualization without complications, and a new VPS was implanted. The patient received 10 days of antibiotic therapy, showed no new neurological deficits or VPS displacement, and the bronchopneumonia solved.

**Conclusions:** There are no similar cases reported in the literature, indicating that congenital diaphragma defect as a risk factor for VPS tube shunt migration in thorax is extremely rare. However, the approach involving antibiotics and the removal and replacement of the VPS under direct observation through laparotomy explores its predisposing factors and aims to reduce its occurrence.

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## Spine

ePoster presentation

### Epidemiologic perfil of spondilocistit in Restauração Hospital

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**Objectives:** Descreva nossa experiência no diagnóstico e manejo clínico da espondilodiscite.

**Background:** Spondylodiscitis is a global term that includes vertebral osteomyelitis, spondylitis, and discitis, accounting for approximately 3 to 5% of all cases of osteomyelitis. It occurs in about 0.5 to 2.5 cases per 100,000 inhabitants/year, with males being more affected. It has a bimodal incidence peak, the first peak up to 20 years old and the second between 50 and 70 years old. Most cases have an indication for non-surgical treatment; surgery is reserved for specific cases.

**Methods:** We performed a prospective cohort study in a tertiary centre in Pernambuco, Recife, Brazil we investigated spondylodiscitis in all patients with back pain without history of trauma or Neurological deficits without diagnosis of degenerative spine disease. The diagnosis of spondylodiscitis was confirmed in all cases with MRI. Study period was two years.

**Results:** In the study period we diagnosed 31 patients with spondylodiscitis, 58% were Male, mean of age was 64.9 Years old, main comorbidities were systemic arterial hypertension, dialitic kidney failure and diabetes, previous non neurological surgeries (Cesarean births, permanent vascular catheter for dialysis, cardiac surgery etc) was identified as a risk factor, 58% of patients has a motor weakness, and L4-L5 were most frequent affected level. Antibiotic therapy was used accordingly currents guidelines.

**Conclusions:** The clinical profile of our patients was 6th decade of life, man patients with neurological impairments, clinical managing has a favorable outcomes.

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## Global Neurosurgery

Oral presentation

Operative autonomy in Andean Latin American neurosurgical training: an underrated driver of academic excellence

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**Objectives:** To investigate inequalities in operative autonomy in neurosurgical residencies of Andean Latin America and its impact on neurosurgical anatomy learning.

**Background:** Neurosurgical residency training in Andean Latin American countries does not have case minimums or a standardized curriculum. Residency training is therefore a matter of hospital preference, financial resources and teaching style of the operating neurosurgeon. The classic residency training model in Andean Latin America is based on hierarchical passive teaching that depends on clinical service-based experience. The resident role in the operating room defines the learning curve and operative skill. The influence that operative autonomy has on neurosurgical anatomy knowledge in the geopolitical and cultural singularities of Latin America has not been previously assessed.

**Methods:**

A sample of 132 neurosurgical residents representing all Andean Latin American countries (capital and urban hospitals) participated on an online neurosurgical anatomy scored questionnaire and operative experience survey. Neurosurgical anatomy Knowledge was classified into 4 tiers of excellence (subpar, basic, advanced, connoisseur) based on their questionnaire score. Autonomy was defined as surgical leadership role during the key part of a surgical procedure with or without direct supervision.

**Results:** Resident operative autonomy was greater in capital training programs than their urban counterparts  $r=0.33$ ,  $F_{13,4}$ ,  $p=0.01$ . Chief residents from capital programs had more autonomy (30% of logged cases, average 11 SD=6) than their urban counterparts (15%, average 2.5, SD1.3),  $p=0.01$ . Volume of supratentorial cases was the strongest predictor of operative autonomy  $r=0.71$ ,  $p<0.01$ , followed by availability of a functioning microscope ( $r=0.41$ ,  $p<0.01$ ). Operative autonomy correlated positively with tier of excellence in neurosurgical anatomy knowledge,  $r=0.44$ ,  $p<0.01$ . All Andean countries were equally represented,  $p=0.9$ .

**Conclusions:** Resident operative autonomy is key to foster excellence in academic neurosurgery. There is an alarming inequality in operative autonomy and knowledge base across Andean Latin American neurosurgery residency programs. Global neurosurgical education may bridge this teaching gap.

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## Oncology

ePoster presentation

Optic nerve sheath diameter as a predictor of severity and complications in neurosurgical patients diagnosed with brain tumor

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**Objectives:** To evaluate the association between the degree of optic nerve sheath distension and functional prognosis in patients undergoing surgical treatment for brain tumor resection.

**Background:** Introduction: Brain tumors determine high morbidity and mortality rates, especially in cases where there is intracranial hypertension (ICH) prior to the surgical procedure. Optic nerve sheath diameter (ONSD) is an easily feasible noninvasive diagnostic tool that indirectly assesses ICH.

**Methods:** This study is a prospective cohort, which evaluated ONSD in patients diagnosed with brain tumor undergoing surgery. The ONSD was performed preoperatively, immediately postoperatively, and at 3 months. The primary endpoint was the Karnofski score (KPS) assessment at 3 months.

**Results:** 31 patients were evaluated, with a mean age of 50 years. A Glasgow Coma Scale (GCS) score of less than 14 fitted almost perfectly with the outcome, as did a preoperative KPS of less than 70. The preoperative ONSD value greater than 6.1 mm also predicted the unfavorable outcome at 3 months almost perfectly ( $p < 0.0001$ ). The ROC curve of the preoperative ONSD was 0.96 (95% CI 0.89-1,  $p = 0.0002$ ). There was a significant reduction in the postoperative ONSD ( $p = 0.001$ ).

**Conclusions:**

Preoperative ONSD seems to be associated with functional outcome and mortality at 3 months in patients undergoing brain tumor surgery. In the present study, the cutoff point of preoperative ONSD for functional outcome was 6.1 mm.

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## Oncology

ePoster presentation

### Optic nerve sheath diameter and intracranial pressure waveform morphology in patients sustaining brain tumors

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**Objectives:** Evaluate if there's a correlation between the optic nerve sheath diameter (ONSD) and intracranial pressure waveform (ICPw) morphology data obtained in patients with brain tumors.

**Background:** Intracranial Pressure (ICP) assessment is crucial for evaluating patients affected by several pathologies, including traumatic brain injury, stroke, hydrocephalus, and parenchymal lesions such as tumors or abscesses. However, assessment in awake patients is only possible with indirect measures obtained through non-invasive methods, and establishing the relationship between different available tools is essential to understand its usefulness in different clinical scenarios.

**Methods:** A single-center, prospective cohort study was conducted at the Neurosurgery Service of University Hospital Getúlio Vargas in Manaus (AM), from December 2020 to April 2022. The study population comprised adult patients with benign and malignant brain tumors submitted to elective surgery. Pre and postoperative ONSD and ICPw morphology were performed. The ICPw morphology was obtained through non-invasive Brain4Care sensor, being extracted the P2/P1 ratio. Pearson correlation test was performed to assess the main objective.

**Results:** 39 patients were recruited. There was a significant difference between pre-op ONSD and post-op ONSD (5.40 mm  $\pm$  0.14 and 5.27 mm  $\pm$  0.15, respectively). When analyzing the Karnofsky Functional Scale (KPS), the mean preoperative value was 90 and the mean postoperative value was 80. There was no difference between the values of the pre-op P2/P1 ratio and post-op ratio (1.16  $\pm$  0.28 and 1.19  $\pm$  0.38, respectively). There was no correlation between the ONSD and P2/P1 ratio. One patient with a high postoperative P2/P1 ratio had an intracranial hematoma but did not show an ONSD increase.

**Conclusions:** In most cases, the ONSD and the P2/P1 ratio were normal in patients sustaining brain tumors submitted to elective surgery. There was no correlation between these two variables. A study with a more significant number of patients may be essential to evaluate postoperative complications.

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## Spine

Oral presentation

Initiation of robotic-guided spine surgery: analysis of the first three years at a single center

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**Objectives:** The aim of this study is to present experience in initiation of robotic-guided spine surgery with thoracolumbar pedicle screw placement using Brainlab's Cirq® surgeon-controlled robotic arm (BrainLab, Munich, Germany) in a single center in the first three years.

**Background:** Robotics in spine surgery is currently used only for assisted pedicle screw placement, i.e. placement of K-wires and shows improved accuracy compared to spinal navigation, fluoroscopy and freehand technique.

**Methods:** All patients who underwent robotic-assisted implantation of pedicle screws in the thoracolumbar spine at our Department in period January 2020 – April 2023 were included in the study. Pedicle screw accuracy was assessed using Gertzbein-Robbins scale (GRS).

**Results:** A team of two surgeons conducted 54 surgeries in 53 patients (26 female, median age  $69.5 \pm 10.4$  years) with robot-assisted pedicle screw placement. Indications included degenerative spine disease (n=15 patients), spondylodiscitis (n=13), metastases (n=10), primary spinal tumors (n=2) and fracture (n=9). 15 surgeries were performed in thoracic spine, 20 in lumbar and lumbosacral spine and 19 in thoracic and lumbar spine. Workflow included intraoperative computed tomography (iCT) imaging with automatic registration, fusion with preoperative imaging and review of the preplanned screw trajectories, robotic-assisted insertion of K-wires, followed by a fluoroscopy-assisted insertion of pedicle screws (first 12 surgeries) or insertion of navigated screws (latter surgeries), with control iCT scan. Total number of screws was 343. 27 cases were percutaneous surgeries. Mean robotic time was  $31:24 \pm 12:24$  minutes. Mean time per screw was  $04:36 \pm 01:58$  min. Mean robotic time and mean time per screw improved over time. 336 screws were clinically acceptable (GRS A, B and C). A total of 7 screws (2%) were GRS D and E screws, for which intraoperative revision was performed.

**Conclusions:** Learning curve is shown through improvement of total robotic time and time per screw. Accuracy of placement of pedicle screws was constant.



1350

## Epilepsy

Oral presentation

### Morphometrics of multilobar resections for epilepsy

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**Objectives:** To identify key morphometric variations and surgical landmarks to enhance resection adequacy, safety and seizure outcomes of multilobar resections (MLR) for epilepsy.

**Background:** About 8-10% of large intrinsic brain resections for drug resistant epilepsy entail resections of 2 or more lobes (multilobar). A variety of pathological substrates and morphometric lobar variations offer additional challenges in multi lobar resections. Sub optimal resections, unplanned functional deficits and poor seizure outcomes could compromise ideal surgical results.

**Methods:** We examined our centre's epilepsy surgery experience of 2630 cases since 1995 and evaluated 230 consecutive cases of multilobar resections. We aimed to identify key surgical landmarks and morphometric variations across the procedural and pathological spectrum of multilobar resections using intra-operative observations, surgical videos and post-operative imaging. The key objectives were to optimise resection limits, limit adverse events and enhance seizure outcome benefits.

**Results:** The spectrum of multilobar resections included fronto-temporal,fronto-temporo-insular(anterior quadrant),parieto-occipital,parieto-temporo-occipital(posterior quadrant) resections. Malformations of cortical development and gliotic scars formed the major bulk of pathological entities.Morphometric variations in hypertrophic lobes (hemimegalencephaly) and atrophic lobes(post infarct gliosis) posed further challenges.Key surgical landmarks, limits and morphometric variations were identified based on the resection extent and surgico-pathological variations. Sulcogyral, intrinsic parenchymal, ventricular, cisternal, dural and vascular (arteriovenous) surgical landmarks were described for the spectrum of multilobar resections.

**Conclusions:** Key surgical landmarks (sulcogyral, parenchymal, cisternal, dural and vascular) in multilobar resections aid to enhance optimum resection limits and seizure outcomes. These aid to overcome surgical challenges posed by multilobar morphometric and pathological variations, thereby creating safe and efficacious surgical 'sub-steps' in major multilobar resections.

## Education, Ethics, Socioeconomic

ePoster presentation

### Woman in Andean Latin American neurosurgery: inequality within inequality

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<sup>1</sup>Barrow Neurological Institute, Neurosurgery, Phoenix, United States, <sup>2</sup>Hospital Nacional Cayetano Heredia, Neurosurgery, Lima, Peru, <sup>3</sup>Hospital Regional de Moquegua, Neurosurgery, Lima, Peru

**Objectives:** To investigate gender inequalities in neurosurgical training in Andean Latin America.

**Background:** Neurosurgical leadership positions in Andean Latin America are predominantly male. Historical, cultural and geopolitical factors may play a role in gender leadership inequality within the Andean Latin American society as a whole. The existence of gender inequality and its potential specific influence in neurosurgical training have not been assessed previously.

**Methods:**

A sample of 132 neurosurgical trainees (from 1st year residents to 5th year practicing neurosurgeons) representing all Andean Latin American countries (capital, urban and rural hospitals) answered a web-based neurosurgical anatomy knowledge assessment and a survey on clinical and educational experience. Neurosurgical anatomy knowledge was tiered into 4 levels of excellence (subpar, basic, advanced, connoisseur) based on their assessment score.

**Results:** Male trainees represented 84% of the sample. Woman representation within each training year was similar,  $p=0.5$ . No woman had more than 2 years of attending experience. Urban trainees logged statistically significantly less cases than their capital counterparts,  $p<0.01$ . Woman residents had less supratentorial experience (average 8.3 cases logged) than their male counterparts (average 18 cases logged),  $p=0.01$ . This difference remained true regardless of the training program (Urban vs Capital),  $p=0.25$ . Female residents had less autonomy (average 2 cases) than males (average 13.7 cases),  $p=0.02$ . Albeit training opportunity inequalities, woman achieved similar tier of excellence in neurosurgical anatomy as man,  $p=0.08$ . More woman (71%) than man (40%) responded that lack of educational courses was the limiting factor to achieve their next tier of excellence. Most woman (76%) responded that a web-based neurosurgical anatomy curriculum would lower patient harm.

**Conclusions:** There is gender inequality in Andean Latin American neurosurgical training. Woman training in urban Andean Latin American neurosurgical programs have to overcome inequality of gender within inequality inherent to program location. It is critical to promote gender equality in organized Latin American neurosurgery.

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## Spine

ePoster presentation

Polyetheretherketone versus titanium polyetheretherketone for transforaminal lumbar interbody fusion: a systematic review and meta-analysis of randomized controlled trials

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### Objectives:

This study aims to compare PEEK versus TiPEEK for TLIF.

**Background:** Transforaminal lumbar interbody fusion (TLIF) is an established, safe technique for fusing the lumbar spine. The effectiveness of this procedure depends on the choice of the interbody cage. Two commonly used materials for these cages are Polyetheretherketone (PEEK) and Titanium-coated PEEK (TiPEEK). Despite their extensive utilization in TLIF, the comparative effectiveness of these materials remains contentious.

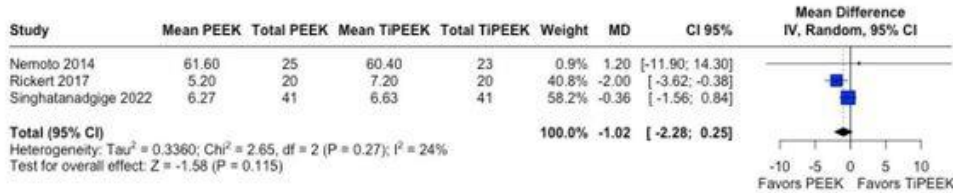
**Methods:** PubMed, Embase and Cochrane databases were searched through June 2023. Statistical analysis was performed using R version 4.3.0. Random-effects meta-analysis and 95% CI were estimated using the DerSimonian-Laird estimator. The outcomes assessed were: Visual Analogue Scale (VAS) score for low back and leg pain, EuroQoL 5 Dimensions (EQ-5D) and Oswestry Disability Index (ODI).

### Results:

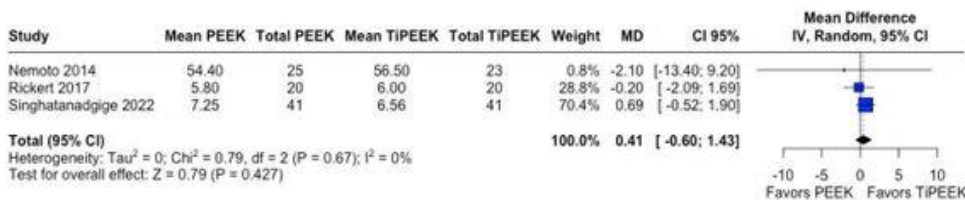
Were included 3 studies involving 170 patients, the total mean age of the patients was 58 years old. There is a decrease in the VAS score for low back pain (MD -1.02, 95% CI -2.28 to 0.25,  $p=0.115$ ,  $I^2 = 24\%$ ), an increase in the VAS score for leg pain (MD 0.41, 95% CI -0.60 to 1.43,  $p=0.427$ ,  $I^2 = 0\%$ ). There is an improvement in the EQ-5D (MD 0.03, 95% CI -0.06 to 0.13,  $p=0.508$ ,  $I^2 = 0\%$ ), and a reduction in the ODI (MD -4.63, 95% CI -9.99 to 0.73,  $p=0.090$ ,  $I^2 = 0\%$ ) (Fig. 1).

**Fig. 1** Forest plot outlining random effects meta-analysis for the outcomes **a** VAS score for low back pain, **b** VAS score for leg pain, **c** EQ-5D, **d** ODI

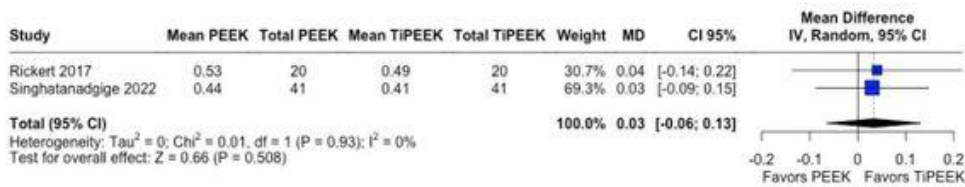
**(a) Visual Analogue Scale Score for Low Back Pain**



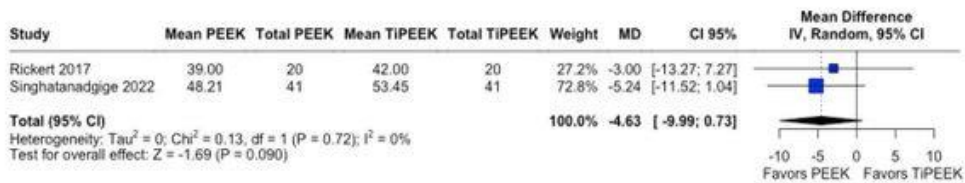
**(b) Visual Analogue Scale Score for Leg Pain**



**(c) EuroQol 5 Dimensions**



**(d) Oswestry Disability Index**



**Conclusions:** Despite the observed decrease in VAS score for low back pain and reduction in the ODI, along with the improvement in EQ-5D, none of these results reached statistical significance. The increase in VAS score for leg pain, although not statistically significant, suggests the intervention may not be as beneficial for this outcome. Further studies are needed to definitively establish the effectiveness of the PEEK for TLIF.

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## Endovascular Neurosurgery

Oral presentation

Pipeline embolization device for the treatment of intracranial aneurysms: a systematic review and meta-analysis of randomized controlled trials

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**Objectives:** This study aims to evaluate the clinical outcomes of patients presenting intracranial aneurysms treated with PED.

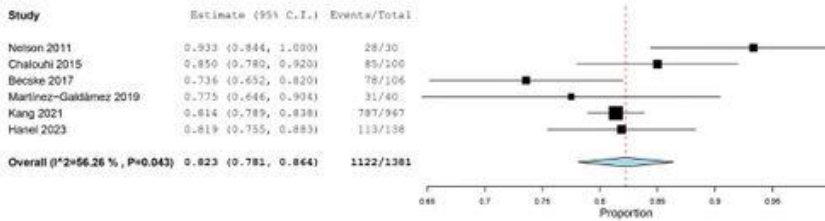
**Background:** Flow diverters have changed intracranial aneurysms (IAs) treatment introducing a minimally invasive therapy that can be used to treat effectively.

**Methods:** Meta-analysis was performed according to the PRISMA statement. PubMed, Embase, and Cochrane databases were searched from inception to June 2023. Statistical analysis was performed using OpenMeta[Analyst]. Random effect model was applied to synthesize the pooled proportions of primary outcomes: complete occlusion (CO) and Modified Rankin Scale 0–2 (mRS 0–2). Secondary outcomes: residual aneurysm (RA) and residual neck (RN).

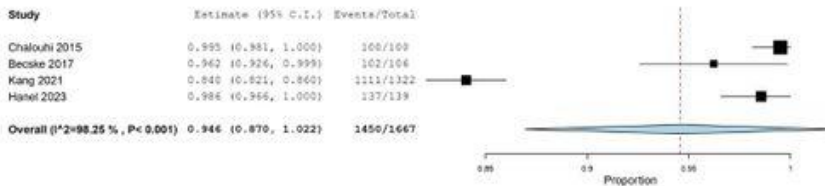
**Results:** Were included 6 studies involving 1,381 patients. The total mean age of the patients was 54 years old, 198 males (14.34%) and 1,183 females (85.66%). PED demonstrated a mean CO rate of 82.3% (95% CI 0.781 to 0.864,  $p=0.043$ ,  $I^2 = 56.26\%$ ,  $SE=0.021$ ) and mRS 0-2 mean rate was 94.6% (95% CI 0.870 to 1.022,  $p<0.001$ ,  $I^2 = 98.25\%$ ,  $SE=0.039$ ). RA mean rate was 9.5% (95% CI 0.041 to 0.149,  $p=0.058$ ,  $I^2 = 59.91\%$ ,  $SE=0.027$ ) and RN mean rate was 4% (95% CI 0.044 to 0.080,  $p=0.066$ ,  $I^2 = 58.38\%$ ,  $SE=0.019$ ) (Fig. 1).

**Fig. 1** Forest plot outlining random effects meta-analysis for the outcomes **a** complete occlusion, **b** mRS 0–2, **c** residual aneurysm, **d** residual neck

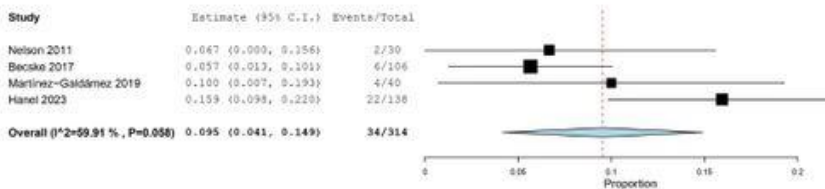
**(a) Complete Occlusion**



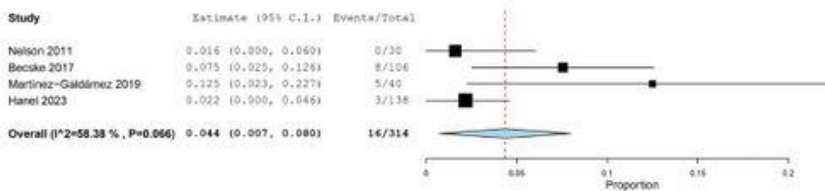
**(b) Modified Rankin Scale 0-2**



**(c) Residual Aneurysm**



**(d) Residual Neck**



**Conclusions:** PED is highly effective and statistically significant for CO and mRS 0-2. In comparison, the relatively low rates of RA and RN further emphasize the superiority of PED as a treatment modality. These findings suggest the importance of PED as a primary intervention for IAs, significantly improving patient outcomes while minimizing the need for additional treatments.

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## Neurovascular Surgery

Oral presentation

IVF plus EVD versus EVD alone for intraventricular hemorrhage with acute obstructive hydrocephalus: a systematic review and meta-analysis

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**Objectives:** This study aims to assess the efficacy and safety comparing IVF+EVD and EVD alone for IVH with AOH.

**Background:** Intraventricular hemorrhage (IVH) with acute obstructive hydrocephalus (AOH) occurs when blood accumulates in the ventricular system (VS). Intraventricular fibrinolysis (IVF) is an approach that involves administering a fibrinolytic agent directly into the VS to dissolve blood clots. IVF and EVD combination has been proposed to maximize the benefits of both therapies and promote rapid clot resolution.

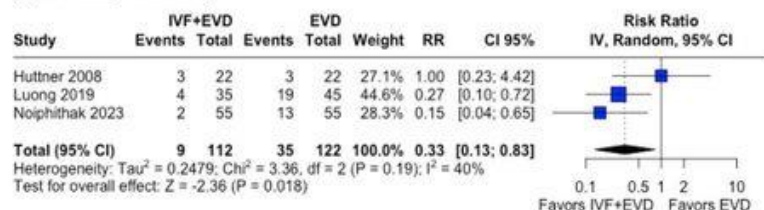
**Methods:** PubMed, Embase and Cochrane databases were searched through June 2023. Statistical analysis was performed using R version 4.3.0. Random-effects meta-analysis were estimated using the inverse variance with Mantel-Haenszel method and DerSimonian-Laird estimator. The primary outcome was 30-day mortality and mRS (modified Rankin scale) 0-3 > 90 days, and the secondary outcomes were Glasgow Coma Score (GCS) < 8, Graeb Score (GS) 0 to 12 and mRS 4-6 > 90 days.

**Results:** Were included 3 studies involving 234 patients with 112 patients in IVF+EVD (47.9%) and 122 in EVD (52.1%). IVF+EVD showed a significant reduction in 30-day mortality (RR 0.33, 95% CI 0.13 to 0.83,  $p=0.018$ ,  $I^2 = 40%$ ) and a significant improvement in mRS 0-3 > 90 days (RR 1.52, 95% CI 1.14 to 2.04,  $p=0.005$ ,  $I^2 = 31%$ ). There are no significant differences observed for GCS < 8 (MD -0.19, 95% CI -1.68 to 1.31,  $p=0.805$ ,  $I^2 = 68%$ ), GS 0 to 12 (MD -0.43, 95% CI -1.16 to 0.30,  $p=0.245$ ,  $I^2 = 49%$ ) and mRS 4-6 > 90 days (RR 0.69, 95% CI 0.47 to 1.00,  $p=0.052$ ,  $I^2 = 43%$ ) (Fig. 1).

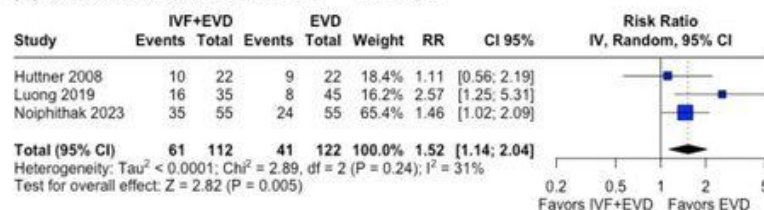


**Fig. 1** Forest plot outlining random effects meta-analysis for the outcomes **a** 30-day mortality, **b** mRS 0-3 > 90 days, **c** GCS < 8, **d** GS 0 to 12, **e** mRS 4-6 > 90 days

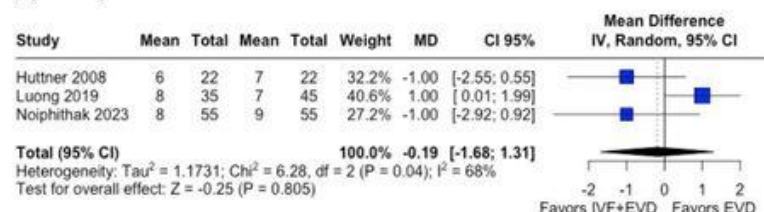
**(a) 30-day mortality**



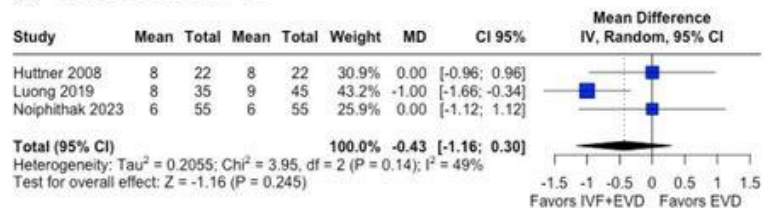
**(b) Modified Rankin Scale 0-3 > 90 days**



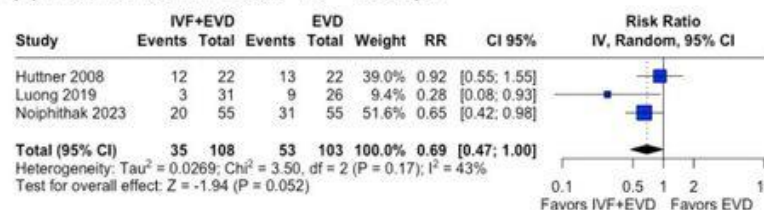
**(c) Glasgow Coma Scale < 8**



**(d) Graeb Score 0 to 12**



**(e) Modified Rankin Scale 4-6 > 90 days**



**Conclusions:** IVF+EVD are associated with reduced 30-day mortality and improved functional outcomes in mRS 0-3 compared with EVD alone. No statistical significance was observed on GCS, GS and mRS 4-6 scores outcomes.



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## Global Neurosurgery

ePoster presentation

In order to prevent wound problems in cranioplasty surgery, the new technique "changing the original curve" with 3D modeling support

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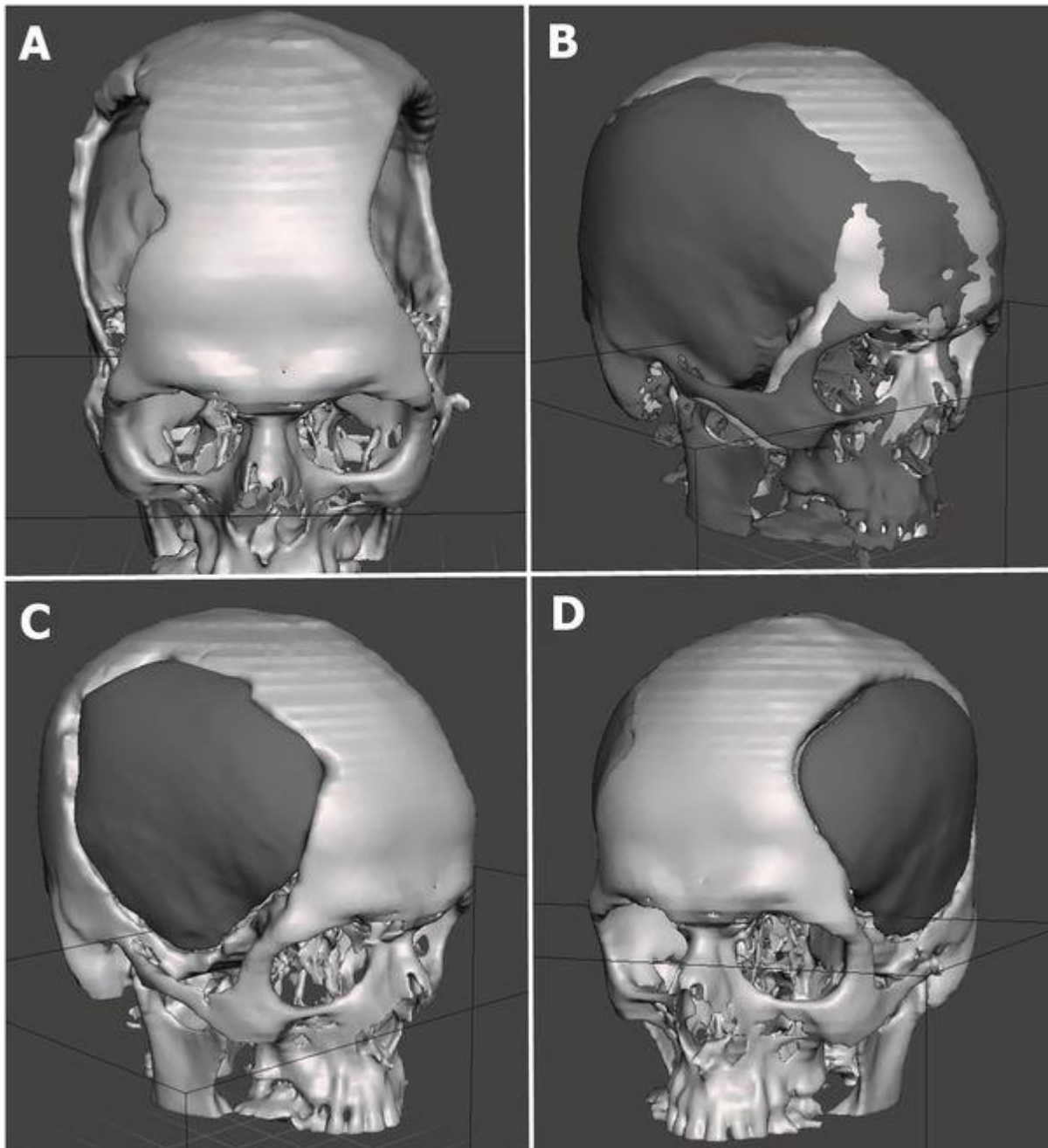
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**Objectives:** In patients with large skull defects, for example after decompressive hemicraniectomy, cranioplasty is performed regularly for mechanical, cosmetic and physiological reasons.

**Background:** Manual molding of cranioplasty implants after craniectomy is possible, but does not always yield satisfactory cosmetic results. In contrast, 3D printing can provide precise templates for intraoperative molding of polymethylmethacrylate (PMMA) implants in cranioplasty.

**Methods:** A 42-year-old male patient who developed traumatic brain injury after falling from a height underwent bilateral frontotemporoparietal decompression surgery. During the intensive care follow-up of the patient, the bone was discarded after the bone embedded in the right thigh lateral became infected. Later, the patient with necrotic areas in his cranial wound was evaluated by the plastic surgery team of our hospital, and the tissue graft was taken and the flap was turned. Afterwards, the patient, who did not have any wound site problems, was discharged with health. In the future, a three-dimensional template was designed in a virtual environment so as not to create tension at the wound site and to reduction of the craniectomy curve of the bone for the patient who is scheduled for cranioplasty operation. The designed template was printed with sandwich modeling with the help of a 3D printer.



**Results:** No intraoperative complications occurred; PMMA molding was uneventful and all implants fitted well in craniectomy defects. Excellent skull reconstruction was confirmed on all postoperative computed tomography scans. No operative mortality or new and permanent neurological deficits were recorded.

**Conclusions:** With the reduction of the craniectomy curve principle focusing on the reconstruction of the skull shape and perfect closure of the craniectomy defect, wound healing was uneventful and showed excellent cosmetic results. This method, which we have done, has revealed the wound healing and cosmetic advantages of implants made with computer aided 3D modeling.

## Education, Ethics, Socioeconomic

ePoster presentation

Are trauma specialists as heterogenous as the patient populations they enrol? A systematic sampling review of randomized controlled trials

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**Objectives:** To determine whether surgical trialists were as diverse as the populations they treated, we investigated the sex/gender and race/ethnicity of participants and compared them to authors of randomized controlled trials (RCTs) for trauma subspecialties in neurosurgery and orthopedic surgery.

**Background:** Academic surgical literature defines current practice standards. However, academic surgery possesses gender and race disparities that have been well documented. As such, the American Surgical Association Task Force released a white paper that identified areas for improvement to address past deficiencies to ensure equity, diversity, and inclusion in academic surgery. Although surgical fields are embracing efforts to enhance gender and diversity, surgeons do not reflect their patient population.

**Methods:** Embase and MEDLINE were systematically searched from 2001 to 2021. RCTs were limited by impact factor and selected using a series technique. Data on author and trial characteristics were extracted in duplicate and compared for each specialty. A subgroup analysis was conducted for trauma subspecialties.

**Results:** 774 articles met inclusion criteria. Subgroup analysis for trauma RCTs was conducted for neurosurgery (n=5, 3%) and orthopedic surgery (n=28, 25%). The mean proportion of women surgical trialists in neuro-trauma RCTs to the patient population treated for sex/gender was more representative for neurotrauma compared to general neurosurgery (trauma: 6%:5% vs general: 5%:48%). A similar trend was found for orthopedic RCTs (trauma: 7%:13% vs general: 22%:32%). The mean proportion of non-Caucasian surgical trialists in neuro-trauma RCTs was most representative of their participants (44% vs 50%). When analyzing the fields overall, the highest proportion of non-Caucasian authors was in neurosurgery, and the lowest in orthopedic surgery (60% vs 30%). No RCTs excluded participants based on sex/gender or race/ethnicity criteria.

**Conclusions:** Unlike general neurosurgery trialists, neurotrauma trialists had improved concordance with both sex/gender and racial diversity. Similarly, orthopedic trauma trialists had better concordance for sex/gender compared to general orthopedic surgical trialists.

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## Trauma

Oral presentation

Traumatic bifrontal contusions: a review of the optimal treatment strategies

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**Objectives:** To identify management strategies and outcomes of patients diagnosed with traumatic bifrontal haemorrhagic contusions (TBHC) treated in a high volume central hospital.

**Background:** TBHC often can be misleading during initial presentation. The development of edema and the possible enlargement of the hemorrhagic contusion may result in cerebral herniation and mortality. There is currently no guidelines delineating optimal management of TBHC.

**Methods:** This was a retrospective analysis of 67 consecutive patients diagnosed with TBHC treated at Inkosi Albert Luthuli Central Hospital between January 2016 and February 2023. We assessed clinical and CT scan features, demographics, treatment modalities, in-hospital mortality, duration of hospital admission and Glasgow outcome scale (GOS).

**Results:** The mean admission GCS = 10.4. The commonest mechanism of injury was motor vehicle crash (MVC) (20; 29.85%). Eighteen patients died (27%). Mortality was highest (%) among victims of pedestrian vehicle accidents (PVA). During admission, the following management strategies were used 1) clinical observation [25, 37.31%], 2) intracranial pressure monitoring, [ 27; 40.3%], 3) bifrontal decompressive craniectomy (BDC) without evacuation of contusions [11; 16.4%] and 4) BDC with evacuation of one or both contusions [4; 5.97%]. The mortality associated with each management strategy was 12%, 11.11%, 72.72%, 25% respectively. 7 (10.4%) had favourable GOS (4 to 5) at discharge, while 38(56.71%) who had unfavourable GOS (2-3).

**Conclusions:** In our study TBHC are frequently caused by PVA and majority of patients undergo intracranial pressure monitoring. These patients require strict monitoring as these lesions are dynamic and can cause sudden neurological deterioration.

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## Oncology

ePoster presentation

### Analysis and outcomes of adult patients with malignant brain tumours in a tertiary hospital in Durban

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**Objectives:** To report the demographic, clinical and radiographic features and outcomes of adults with malignant brain tumours in our tertiary centre.

**Background:** Despite central nervous system (CNS) tumours causing substantial morbidity and posing an increasing public health concern in South Africa, epidemiological data on malignant brain tumours is lacking. The increasing ageing population coupled with a stubbornly high prevalence of HIV, both associated with an increased risk of malignancy, increase the urgency for study in this field.

**Methods:** We performed a retrospective analysis of medical records of all adult patients (age > 18) with histologically diagnosed malignant brain tumours at the Department of Neurosurgery at Inkosi Albert Luthuli Central Hospital between January 2016 and December 2022. We analysed patient demographics, HIV status, neuro-imaging characteristics, management, mortality and Glasgow outcome scale.

**Results:** There were 165 subjects with an almost equal sex distribution, female 83 (50.3%), male 82 (49.7%). The mean age was 47 ( $\pm 15.63$ ), [age 19-30 (27, 16.36%), 30-45 (43, 26.06%), 45-65 (75, 45.45%), >65 (20, 12%)]. Metastatic tumours accounted for 42/165 (25.45%) with a mean age of 55 ( $\pm 14.65$ ) with lung (26.19%) and breast (19.04%) being the most common primary sources. Glioblastoma was the most common primary brain tumour. 75 (44.8%) patients were HIV infected and the mean age for glioblastoma in this group was 41 ( $\pm 8.43$ ). In-hospital mortality occurred in 29 (17.57%) while a poor outcome (GOS 2-3) was found in 51 (30.9%). In-hospital mortality was most common in the 30-45 (23.55%) and 19-30 (16.36%) age groups and was least common in age group >65 (10%), with sepsis accounting for most deaths.

**Conclusions:** Patients with primary brain malignancies in our population present younger and have a poorer outcome than their older counterparts.

1361

## Spine

Oral presentation

Spectrum of compressive spinal masses diagnosed in HIV-infected patients managed at a single tertiary hospital

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**Objectives:** To describe the compressive spinal masses diagnosed in consecutive HIV infected patients referred for management at a single tertiary hospital over a 7-year period.

**Background:** The Province of KwaZulu-Natal (KZN) has the highest HIV prevalence rate in South Africa. Local and international studies have reported on intracranial masses in HIV positive patients; however, there is paucity of data reporting on compressive spinal masses in HIV infected patients.

**Methods:** Retrospective study, whereby data was collected from medical records of consecutive HIV infected patients treated between January 2010 and December 2017. Data collected included demographic profile, clinical characteristics, laboratory results, CD 4 count, MRI spine reports and histology results. We categorized the pathology according to the spinal compartment and level affected.

**Results:** A total of 45 HIV infected patients met inclusion criteria. The median age was 33± 13 (range of 20 - 64 years). There were 29 (64.4%) males and 16 (35.6%) females. The most frequent clinical presentations were paraplegia (80%), followed by sphincter dysfunction (78%). The median CD4 count was 314 cells/uL (IQR 236- 109). Histology results confirmed lymphoma [19; 42.2%]; TB [13; 29%]; Meningioma [6; 13%]; EBV associated smooth muscle tumour [3; 7%], Pyogenic abscess [2; 4.4%], Schwannoma [1; 2.2%] and Rosai dorfman disease [1; 2.2%]. The extradural compartment (80%) and thoracic spine (60%) were the most frequently affected compartments.

**Conclusions:** In our study lymphoma was the commonest compressive spinal pathology diagnosed in HIV infected patients treated at our institution. This is an important findings in a Province with high burden of HIV/AIDS. These findings assist clinicians in having a high index of suspicion when treating HIV infected patients with spinal masses.

1362

## Trauma

Oral presentation

Traumatic brain injury in the elderly population: a 20-year experience in a single neurosurgery centre in Kwazulu Natal

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**Objectives:** To describe the demographic profile, mechanism of injury, neuro-radiological findings, management and outcome of elderly patient treated for traumatic brain injury.

**Background:** Traumatic Brain Injury in the elderly is associated with morbidity and mortality. In low-middle income countries there is paucity of research directed towards management of TBI in elderly patients.

**Methods:** A retrospective review of medical records of elderly patients (aged 65 years and above) with a diagnosis of TBI managed from January 2003 to July 2022.

**Results:** A total of 169 patients were enrolled in the study. The mean age was 71 years. There were 70% males and the male-to-female ratio was 2.1:1. The mechanism of injury included falls (39.6%), interpersonal violence (30%), road traffic accidents (17%) and unknown mechanism (17%). Neuro-radiological findings included Acute Subdural Hematoma (50%), intracerebral hematoma (20%), Acute Extradural hematoma (15%) and depressed skull fracture (15%). Surgical management was undertaken in 72% of patients. Complications included pneumonia(19.6%) wound sepsis (2%), meningitis (1%), post traumatic Hydrocephalus (0.9%), septicaemia (1%), DVT (0,9%). The mean ICU stay was 11 days and the overall mortality was 31%.

**Conclusions:** Tbl in the elderly is less studied in the Lower-middle income countries and is associated with a high mortality rate. Acute Subdural Hematoma is the commonest intracranial pathologies. More resources should be directed towards further research in TBI in elderly in lower-middle income countries.

1363

## Oncology

Oral presentation

Patient-specific 3D-printed topographical cerebral surface anatomy for presurgical planning for meningiomas

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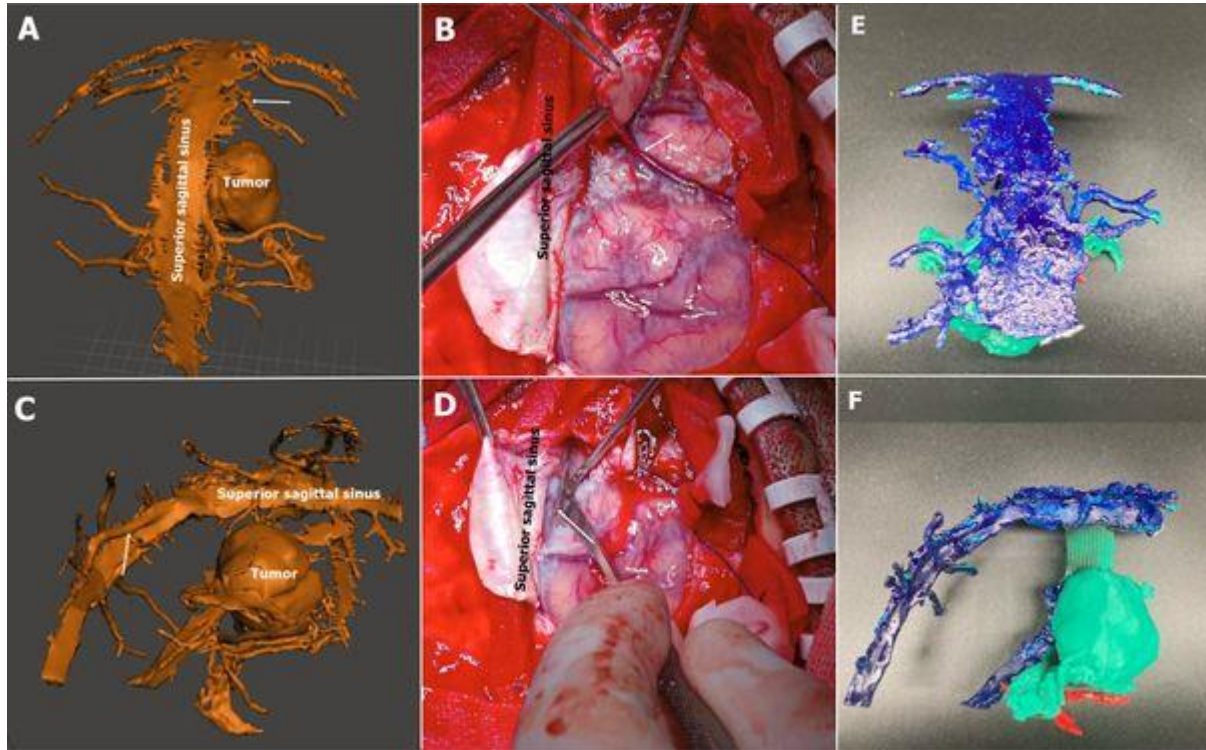
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**Objectives:** The aim of this study is to increase the quality of surgical planning and to enhance to surgeon's orientation using individualized 3D models for meningiomas adjacent to important cortical venous structures.

**Background:** Preoperative assessment of the venous relationships of the meningioma has vital importance in the surgical management of tumors. This relationship can be reconstructed in 3D with personalized models using a 3D printer.

**Methods:** Patient-specific tumor models were printed with a 3D printer preoperatively for a total of 12 patients. The CT and/or MR angiography /venography images of each patient were obtained and were uploaded to the software (Mimics v14, Materialize Corp, Belgium). Models were printed using a 3D printer (Ultimaker 2, Ultimaker B.V., Utrecht) and were assessed preoperatively for surgical planning. Subsequently, the models were sterilized with the aim of giving the surgeons the opportunity to examine the model intraoperatively. The duration of surgery and vascular related complications were recorded. Attending surgeons and residents were asked to evaluate the contribution of the models to the surgery. All data were evaluated with IBM SPSS Statistics v.29.





**Results:** All of operated tumors were meningiomas There was one intraoperative vascular injury. The majority of the surgeons and residents found the 3D models to be helpful for the development of surgical skills.

**Conclusions:** Individualized 3D models can serve as simple and safe tools both pre and intraoperatively for the surgical planning and orientation, thereby, having a positive impact on the surgery.

1364

## Spine

Oral presentation

The clinico-pathological profile and outcomes of spinal empyema

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**Objectives:** The purpose of this study was to report on the clinical, radiological, biochemical, microbiological profiles of patients diagnosed with spinal empyema. We further analyzed treatment outcome.

**Background:** Spinal empyema is a rare neurosurgical pathology associated with high morbidity and mortality, when left untreated.

**Methods:** This was a retrospective study which included 24 patients admitted to a neurosurgery unit in a tertiary hospital in Durban, with the diagnosis of spinal empyema. The study period was between December 2004 and November 2015. Electronic medical records were reviewed for clinical characteristics, radiological, biochemical and microbiological findings, as well as treatment outcomes.

**Results:** The median age at presentation was 36 years (range 1-71). The majority (58%) of patients were males. Most frequent clinical findings were paraparesis (46%) and sphincter dysfunction (58%). Median CRP upon admission was 168. MRI spine revealed spinal compartment involved to be epidural (83%) and intradural (17%). The spinal segments involved were thoracolumbar (33%), thoracic (29%), lumbar (21%) and cervical (4%). A total of 11 patients (46%) had improvement in their neurological condition following antibiotic therapy and surgical intervention. *Staphylococcus aureus* was the most frequently isolated microorganism (42%). The mortality rate was 17%.

**Conclusions:** Spinal empyema is associated with severe neurological deficits. Early diagnosis and prompt surgical treatment are crucial in cases of spinal empyema in order to prevent permanent neurological deficits.

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## Skull Base

Oral presentation

Minimally invasive middle fossa keyhole craniectomy for repair of superior semicircular canal dehiscence (SSCD): postoperative outcomes

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**Objectives:** To evaluate symptom resolution in a large superior semicircular canal dehiscence (SSCD) patient cohort who underwent minimally invasive middle fossa keyhole craniectomy.

**Background:** SSCD is a rare skull base disorder characterized by an aberrant bony defect between the floor of the middle cranial fossa and the superior semicircular canal (SSC). The dehiscence in the otic capsule structure results in the development of a "third mobile window," which elicits debilitating vestibular and auditory symptoms that require surgical intervention.

**Methods:** A retrospective chart review at the University of California, Los Angeles Medical Center collected patient demographics, intraoperative findings, and pre- and postoperative symptoms. Statistical analysis was performed by Fisher's exact test for categorical variables and Student's t-test for continuous variables for paired comparison of binary measures with a significance level of  $p < 0.05$ .

**Results:** A total of 350 SSCD repairs were performed. The median age was 52 years (range: 17 - 86 years,  $\pm 6.4$  years), and median follow-up duration was 0.46 months (range: 0.03 - 59.5 months,  $\pm 6.8$  months). Preoperative hearing loss was significantly associated with female sex ( $p = 0.0028$ ). The most reported preoperative symptoms were tinnitus (77.4%), dizziness (74.0%), autophony (66.3%), amplification (63.7%), disequilibrium (62.6%), and aural fullness (50.6%). When comparing postoperative symptomatic improvement between patients who received unilateral SSCD repair versus those with bilateral SSCD repair, the greatest postoperative symptomatic improvement was seen in autophony (74.9%,  $p < 0.001$ ), amplification (77.3%,  $p = 0.00027$ ), hyperacusis (77.4%,  $p = 0.023$ ), hearing (62.9%,  $p = 0.0063$ ), and dizziness (54.6%,  $p < 0.001$ ) for patients with unilateral SSCD repair.

**Conclusions:** Surgical repair via the middle cranial fossa (MCF) approach can significantly resolve auditory, vestibular, and neurological symptoms of patients with SSCD. Although this is one of the largest single-institution studies of SSCD to date, multi-institutional, prospective studies would be beneficial to draw stronger conclusions.

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## Skull Base

Oral presentation

Pituitary adenomas in elderly patients: analysis of series in a South African tertiary hospital

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**Objectives:** This study aims to describe the demographics, clinical presentation, radiological features, histological and biochemical profile and post-operative complications in the elderly population treated for nonfunctioning pituitary adenoma at Inkosi Albert Luthuli Central Hospital.

**Background:** Pituitary adenomas (PA) are common benign, slow-growing intracranial tumours with an incidence that increases with age. Surgery is considered the treatment of choice for patients with neurological evidence of compression by the tumour. Surgery is considered riskier in elderly patients.

**Methods:** We conducted a retrospective review of 89 patients aged >60 years who underwent treatment for PA at a single institution from January 2003 to December 2023. Clinical, biochemical and outcomes were described and compared with non-elderly adults ( $\geq 18$  years and  $\leq 65$  years).

**Results:** There were 89 and 190 patients in the elderly and non-elderly groups, respectively. There was a female preponderance in both groups and was similar in magnitude (60.71% vs 60.44%). Most common presenting symptoms in the elderly were headache (92.3%) and visual disturbance (85.7%) and almost all tumours were macro adenomas (>1cm) (96.2%). There was non-significant disparity in average tumour size between the elderly and non-elderly groups (3.43 vs 3.67cm respectively) and had similar rates of cavernous sinus involvement (38.54% vs 40.32%). The majority of patients underwent endoscopic transsphenoidal surgery (87.5%) and CSF leak was the most frequent surgical complication occurring in 6.74%. More elderly patients experienced postoperative diabetes insipidus (DI) (12.34% vs 4.53%). In-hospital mortality was more common in the non-elderly group (4.44% vs 3.57%) as was long-term pituitary hypo function (3.34% vs 2.11%).

**Conclusions:** Patient with PAs presenting to IALCH are frequently diagnosed with macroadenoma Transsphenoidal surgery is safe with a low complication rate however metabolic and biochemical derangements necessitate more intensive post-operative monitoring in the elderly population.

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## Trauma

ePoster presentation

### Chronic subdural haematoma burr holes vs craniotomy

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**Objectives:** To determine the best options in surgery to either do burr holes with or without drainage and craniotomy with membranectomy.

**Background:** Chronic subdural haematoma management has been evolving and the standard burr hole has been used for many years. The recurrence rates have been noted and the issue of using drainage anterior or posteriorly especially in elderly patients with co-morbidities has raised the controversy in management especially in patients with membranes is ongoing and depends on individual decision-making. The pressure of repeating CT scans post-operation presents the surgeon with the issue of when to repeat the operation. Long term follow-up shows that the subdural operative decision determines the outcome.

**Methods:** Review of patients with chronic subdural haematoma--outcome follow up.

**Results:** Recurrence rate depends on CT scan review and operative management.

**Conclusions:** Choice of burr holes remains safe but craniotomy may be the gold standard of chronic subdural with membranes.

1368

## Trauma

Oral presentation

The *Best Care Always Bundle* for the prevention of ventilator associated pneumonia in patients with severe traumatic brain injury

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**Objectives:** Quantify the impact of the “*Best Care Always Bundle*” (BCAB) on Ventilator Associated Pneumonia (VAP)-rate in Severe Traumatic Brain Injury (STBI) patients.

**Background:** STBI is a risk factor for VAP. In STBI, VAP is associated with worse neurological outcomes.

**Methods:** Retrospective review of STBI patients 12-months before (cohort 1) and after (cohort 2) implementation of the VAP-BCAB. Primary outcome: VAP incidence after implementation of BCAB. Secondary outcomes: duration of mechanical ventilation (MV), Neurocritical care unit (NCCU) and hospital length of stay (LoS), mortality, tracheostomy rate, re-intubation rate, and antibiotic use. Adherence to VAP-BCAB and correlation with VAP-rate was also analysed.

**Results:** Incidence of VAP were 24,7% and 18,6% in cohort 1 and 2 respectively ( $p=0.163$ ). Duration of MV 6,7 days (5,4-7,9) and 7,3 days (6,1-8,4) in cohort 1 and 2 respectively ( $p=0.520$ ). NCCU LoS 10,7 days (8,9-12,4) and 10,4 days (8,9-11,8) in cohort 1 and 2 respectively ( $p=0.797$ ). Hospital LoS 21,5 days (16,2-26,9) and 18,0 days (15,3-20,6) in cohort 1 and 2 respectively ( $p=0.246$ ). Thirty tracheostomies (37,5%) were recorded in cohort 1, 33 (31,7%) in cohort 2 ( $p=0.219$ ). Thirteen re-intubations (20%) were recorded in cohort 1, nine (10,2%) in cohort 2 ( $p=0.055$ ). Patients with VAP were fewer (7%) in months with high adherence to the VAP-BCAB, compared to low adherence months (28%) ( $p=0.003$ ).

**Conclusions:** The clinical utility of the VAP-BCAB for the prevention of VAPs in STBI patients was clear in this study but the significance could only be shown where adherence to the VAP-BCAB was high.

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## Neurovascular Surgery

ePoster presentation

Microsurgical clipping vs endovascular treatment outcomes for intracranial aneurysms in the post ISAT era

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**Objectives:** To compare the outcomes of aneurysms treated via microsurgical clipping to endovascular coiling in a local South African population.

**Background:** Rupture of an intracranial aneurysm is the leading cause of non-traumatic subarachnoid haemorrhage. Options to treat aneurysms to prevent re-rupture include microsurgical clipping and endovascular coiling. In 2002 the international subarachnoid aneurysm trial showed that treatment with endovascular coiling lead to a 6.9% absolute risk reduction in death or dependency which has lead to a shift in treatment patterns towards endovascular coiling. Therefore, the aim of this study is to confirm to what extent the findings in the literature are applicable to our local practice and to help guide our clinical decision making when treating patients with aneurysms in our population.

**Methods:** A retrospective review of patients treated with microsurgical clipping via keyhole craniotomy at Helen Joseph Hospital between 2017 and 2021 and patients treated by endovascular methods at Chris Hani Baragwanath Academic Hospital during the same time period. Comparisons of outcomes between the two groups were made based on the modified Rankin Scale with a good outcome being an mRS grade of  $\leq 2$  and stratified by presenting WFNS grade.

**Results:** Only cases with access to files were used, there were 55 cases in the coiling group and 40 patients in the clipping group. 63.6%(35/55) of patients had a good outcome in the endovascular group and 72.5% (29/40) in the keyhole clipping group. ( $p = 0.36$ ) This was improved to 67.3% (33/49) in the coiling group and 92.9% (26/28) in the clipping group and showed a statistically significant difference( $p = 0.02$ ).

**Conclusions:** Microsurgical clipping still has a role to play in the treatment of ruptured aneurysms can have better results than endovascular approaches in certain cases. Keyhole approaches offer an attractive alternative to patients over traditional craniotomies.

1370

## Spine

ePoster presentation

### Anterior cervical discectomy and fusion with iliac autograft in 11 year old patient with traumatic C3/C4 anterolisthesis

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**Objectives:** To report on a case study of an 11 year old female who underwent C3/C4 Anterior Cervical Discectomy and fusion (ACDF) for post traumatic C3/C4 anterolisthesis.

**Background:** The C-Spine is the most frequently involved area in traumatic paediatric spine injuries. Traditionally closed reduction with inline traction is used for paediatric C-spine injuries however the use of C-spine instrumentation has increased substantially over recent years. C-spine instrumentation in children poses challenges due to the differences in anatomy, vertebral cartilage content and instrument availability for paediatric spine surgery. Anterior cervical discectomy and fusion is a commonly utilized technique for treating c-spine instability in adults with posterior approaches reportedly being more common used in children. Iliac autograft is the most common reported grafting site used during spinal fusion in children with favourable results reported in the literature.

**Methods:** A retrospective review of the patient's notes was performed and case study written up.

**Results:** An 11-year-old female sustained a traumatic C3/C4 anterolisthesis (AO: type C) after a door fell on her. She presented with no neurological deficits. Imaging revealed 10% C3 on C4 anterolisthesis with instability due to disruption of her posterior ligamentous complex (SLIC: 4). She was initially managed in halter traction for four weeks which the patient did not tolerate. Subsequently she underwent anterior cervical discectomy and fusion surgery with iliac autograft used to bridge the intervertebral space. Patient did well post operatively, neck pain resolved, and the patient developed no surgical or neurological complications after 6 months of follow up. Post operative flexion and extension confirmed successful fusion and stability of the construct.

**Conclusions:** Anterior cervical discectomy and fusion using iliac autograft can be safe and useful in paediatric patients with post-traumatic unstable C-spine injuries.



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## Hydrocephalus

Oral presentation

Management and outcomes of *Acinetobacter baumannii* meningitis in post-neurosurgical patients at Inkosi Albert Luthuli Central Hospital

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**Objectives:** To assess the susceptibility of *Acinetobacter* isolates to antimicrobials and identify factors that contribute to unfavourable outcomes.

**Background:** *Acinetobacter baumannii* meningitis/ventriculitis is a severe complication diagnosed in post neurosurgical patients. It is associated with high morbidity and mortality rates compared to other types of meningitis.

**Methods:** A retrospective study was conducted on 59 patients who were treated for *Acinetobacter baumannii* meningitis following a neurosurgical procedure at Inkosi Albert Luthuli Hospital from August 2016 to May 2023. Data collected manually from electronic patient records included demographics, co-morbidities, clinical presentation, neurosurgical pathology, length of hospital stay, laboratory-based cerebrospinal fluid (CSF) analyses, antimicrobial susceptibility, and patient mortality.

**Results:** The overall in-patient mortality rate was 52,54% and there were twenty eight (47,46%) survivors. The mean age at presentation was 26,7 years old. There were forty-four (74%) males and fifteen females (25%). Eight (13,56%) patients had immunosuppressive medical co-morbidities. The main primary neurosurgical pathology was traumatic brain injury (62,72%), followed by tumours (20,34%), hydrocephalus (8,47%), sepsis (3,39%), vascular pathologies (3,39%), and other (1,69%). Multidrug-resistant *Acinetobacter baumannii* was cultured in 74% of these patients, most of whom were treated with either intravenous or intrathecal Colistin. On further analysis, ICU admission, more than 4 external ventricular drain (EVD) procedures, MDR *Acinetobacter baumannii* csf isolate and concurrent nosocomial MDR pneumonia were all associated with unfavourable outcomes.

**Conclusions:** *Acinetobacter baumannii* meningitis/ventriculitis has a high mortality rate in post neurosurgical patients. Intravenous and/or intrathecal Colistin is used in the management of MDR *A. baumannii* meningitis. ICU admission, MDR *A. baumannii*, multiple EVD procedures, and concurrent MDR nosocomial pneumonia are associated with poor outcomes. Early diagnosis, meticulous infection control measures and prompt initiation of directed antimicrobial therapy is crucial for improving patient outcomes.

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## Global Neurosurgery

ePoster presentation

The outcomes of management of intracranial sepsis in a neurocritical care unit in Durban, South Africa

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**Objectives:** The purpose of this study was to determine the clinical, radiological, biochemical and microbiology findings, including medical and frequency of surgical treatment of patients diagnosed with intracranial sepsis admitted in the ICU. The primary end points were to determine factors associated with outcome and mortality in patients managed in the ICU setting.

**Background:** Intracranial sepsis is a common neurosurgical pathology diagnosed in low-middle income countries and associated with a high morbidity and mortality rate. There is a paucity of data available on the outcomes in the management of intracranial sepsis in critically ill patients in the ICU setting.

**Methods:** This was a retrospective study which included 50 patients admitted in a tertiary neurocritical care unit with the diagnosis of focal intracranial sepsis. Study period was between January 2015 to June 2023. Electronic medical records were reviewed for clinical characteristics, source of infection, microbiological, biochemical and radiological findings, management strategies, complications and mortality during admission in the neurocritical care unit.

**Results:** The mortality rate was 30%, while two (4%) had severe disability. Predictors of poor outcome included GCS  $\leq 8$  ( $p = 0,002$ ), inotropic requirement ( $p=0,045$ ), infarcts ( $p= 0,014$ ) and hyponatraemia ( $p=0.032$ ). The mean age was  $20 \pm 12$  years, while the median CRP was 225,5 mg/l. Sinusitis was the source of infection in majority of patients (74%) and *Streptococcus anginosus* was the most frequently isolated microorganism (62%). The intracranial pathology on neuro-imaging included subdural empyema (77%), brain abscess (14%) and extradural empyema (11%). Majority (77%) of patients required more than one surgical drainage.

**Conclusions:** In the neurocritical care setting intracranial sepsis is associated with a high mortality. GCS  $\leq 8$ , inotropic requirement, hyponatremia and infarcts were associated with mortality. The source of infection was sinusitis in majority of cases, highlighting the need to strengthen policies regarding early detection and treatment of sinusitis at primary health care level.

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## Oncology

Oral presentation

Brain tumor programs in Asia and Africa: current status, challenges and future perspectives

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**Objectives:** To assess the status of brain tumour programs in Asia and Africa.

Propose a comprehensive evidence-based short-and-long-term measures for improving existing systems.

**Background:** Neuro-oncology has become a well-established subspeciality within the broad field of clinical neuroscience. There are significant advances in molecular diagnostics and therapeutic approaches. However, there are visible disparities in neuro-oncology services across the globe, resulting from deficits in availability of expertise, infrastructure, resources, innovation, research, and financing. The nuances of providing standardized care to different regions of the world need to be understood to facilitate planned strategies aimed at overcoming region-specific challenges.

**Methods:** A cross-sectional analytical study was conducted in June 2022 by the Asia-Africa Neurosurgery Collaborative Group (ASAFRIN-Collaborators). Google online forms was used to design a 27-questions questionnaire to gain insight into the status and future directions of the brain tumour programs within Asia and Africa. Six pillars of brain tumour programs were identified -surgery, oncology, neuropathology, research, training, finances -and assigned scores of 0-14. The total scores allowed sub-classification of each country into levels of brain tumour program as Level I to VI.

**Results:** A total of 110 responses for 92 countries were received.

These were subdivided into three groups - Group 1 (countries with response from neurosurgeons) 73 responses, Group 2 (countries with no neurosurgeons) 19 countries and Group 3 (countries without a neurosurgeon response) 16 countries.

The pillars with highest level of brain tumour program were surgery, neuropathology and oncology.

Most countries in both continents fell in Level III brain tumour program with a mean surgical score of 2.24.

The major lag between each group was with respect to the advances in neuropathology and financial support.

**Conclusions:** There is an urgent need to improve and develop existing and non-existing neuro-oncology 24 infrastructure, personnel and logistics in countries across the continents especially, for the 25 countries without neurosurgeons.

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## Oncology

Oral presentation

ctDNA detection in cerebrospinal fluid and concordance with the primary tumor in a multicenter prospective study of patients with glioma

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**Objectives:** Determine if mutation concordance exists between the ctDNA found in CSF and those in solid tumor.

**Background:** Gliomas are the most common primary brain tumors, but there are many limitations for the implementation of liquid biopsy in this disease. Cerebrospinal fluid (CSF) is emerging as the most reliable reservoir for circulating tumor DNA (ctDNA) analysis, although evidence is still limited.

**Methods:** Prospective study of patients with gliomas diagnosed in two centers. High throughput next generation sequencing (NGS) using a customized gene panel (Illumina, Inc) of 8 genes (IDH1, IDH2, ATRX, TP53, PTEN, PIK3CA, EGFR, BRAF) was used in paired CSF and FFPE and/or fresh tumor samples, and run in an Illumina Miseq instrument (Illumina, Inc). Only confirmed pathogenic mutations were considered as valid. Mutation concordance occurred when the same pathogenic gene variants were detected in tumor and CSF.

**Results:** Between February 2017 and March 2020, 31 glioma patients (pts) were enrolled in which 2-5 ml of CSF were collected intraoperatively prior to surgical manipulation of the tumor. M:F ratio: 22:9. Median age 51 (Min-Max: 20-78). CSF collected at new diagnosis(n=22); relapse(n=9). WHO 5th Ed: IDHMUT astrocytoma (n=9), IDHMUT oligodendroglioma (n=6), IDHWT glioblastoma (n=16). CSF-ctDNA-positive: 18/31 (58%). CSF-ctDNA-negative: 13/31 (42%). No. of mutations in CSF: 1 (9/18), 2 (7/18), 3 (2/18). Frequency of CSF-ctDNA mutated genes: EGFR (8/18: 44%), PTEN (7/18: 39%), TP53 (6/18: 33%), IDH1 (4/18: 22%), PIK3CA (4/18: 22%). Tumor-CSF mutation concordance: 15/18 (83%). After a median follow-up since CSF collection of 20 months (Min-Max: 0-57), median OS was not reached (NR) (95%CI NR-NR). No correlation was found between detection of ctDNA in CSF and distance from closest CSF reservoir, tumor size or IDH status.

**Conclusions:** CSF is a reliable reservoir for ctDNA analyses in patients with gliomas. Larger studies should be conducted in order to refine role of liquid biopsy in Gliomas.

1376

## Neurovascular Surgery

ePoster presentation

Awake craniotomies for low-grade arteriovenous malformations Located in speech areas

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**Objectives:** The objective of this study is to check safety of using conscious sedation for AVM resection.

**Background:** One of the pressing constraints for microsurgery as treatment for arteriovenous malformations (AVM) is the potential development of new neurological deficits, mostly, when the AVM is located in an eloquent area. The risk of ischemia, when an “en passage” arterial supply is present, is not negligible either. The use of awake craniotomies could be useful and increase safety for resection of low grade AVMs.

**Methods:** We conducted a pilot trial on three cases that presented with low-grade AVMs affecting speech areas to evaluate the safety of awake craniotomy. We performed the technique under conscious sedation and neurophysiological control of MEPs and direct cortical and subcortical stimulation. Every feeder was temporarily clipped before its section.

**Results:** None of the three cases presented any neurological deficit after the procedure. Awake craniotomy was useful in one of the cases, as it allowed to detect a speech arrest during the temporal clipping of one of the feeders. This vessel was identified as an “en passage” vessel. It was followed closer to the nidus where a second try of temporal clipping revealed the real feeder of the AVM. This maneuver avoided the closure of the “en passage” vessel and allowed the safe definitive section of the feeder.

**Conclusions:** Awake craniotomies are safe procedures and may be helpful in avoiding ischemic complications in low-grade AVMs either affecting eloquent areas and/or when “en passage” feeders are present.

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## Neurovascular Surgery

ePoster presentation

### Angioarchitecture of ruptured cerebral aneurysms

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**Objectives:** The objective of this study was to evaluate which angioarchitectural variables are related to aneurysmal rupture.

**Background:** Different characteristics of the angioarchitecture of cerebral aneurysms that may be involved in the risk of rupture and prognosis have been described in the literature. The objective of this work is to evaluate in our series of SAH whether the different angioarchitectonic characteristics of saccular aneurysms are related to the risk of rupture and prognosis.

**Methods:** A retrospective study of 47 cases of aneurysmal SAH was carried out, in which different angioarchitectonic variables were analyzed, including location, dimensions of the aneurysm and the vessel of origin, presence of wall irregularities and relationship variables between the different dimensions. . In addition, different clinical and prognostic variables were evaluated.

**Results:** Ruptured aneurysms were located mainly in the previous circulation (Acom, 25.5%; ACM, 21.3%). Most ruptured aneurysms had a neck/dome ratio equal to or less than 1 (83% vs. 17%). This study did not find a direct relationship between SAH and aneurysm size as the only value, nor that the presence of irregularities in the wall was more frequent (51.1% vs. 48.9%). There was no relationship between the angioarchitectural characteristics of the aneurysm and the severity of SAH or the functional prognosis.

**Conclusions:** Regular and small cerebral wall aneurysms can cause SAH with the same frequency as large and irregular aneurysms, which is why aggressive treatment is necessary whenever the patient's characteristics allow it.

1380

## Spine

ePoster presentation

Remote cerebellar hemorrhage after lumbar stenosis surgery: a case report

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**Objectives:** Show a rare complication of spine surgery and discuss some skill to prevent it.

**Background:** Remote cerebellar hemorrhage (RCH) is a rare complication of spine surgery. The pathogenesis is not clearly explained.

**Methods:** We reported a case of 69 year old woman with a surgery for lumbar canal stenosis surgery with a dura tearing and csf leaked during surgery which was closed during the procedure. The patient developed 48 hours after surgery a dysarthria with cardiopulmonary arrest. The CT-scan showed an cerebellar hemorrhage with brainstem ischemia. Unfortunately the patient died.

**Results:** Even if RCH mechanism is unclear most of reported cases suggested a relation between this complication and excessive CSF drainage perioperatively. Minimizing CSF leak during procedure can help to reduce the risk of RCH. A significant loss of CSF during surgery with a deterioration of neurological status have to make consider this diagnosis and an emergency cerebral imaging must be done. Early diagnosis and a good management is the key of full recovery even in cerebellar herniation.

**Conclusions:** Even if it is a rare complication of spine surgery the RCH should be considered in patient with CSF leak during procedure and a close monitoring must be done to prevent a dramatic issue.

1381

## Global Neurosurgery

Oral presentation

Update on global neurotrauma outcomes study spine: international, multi-centre, prospective study on the injury profile, management and outcomes of TSI

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**Objectives:** GNOS Spine aims to provide a comprehensive summary of the management and outcomes of traumatic spinal injury (TSI) worldwide.

**Background:** Traumatic spinal injury (TSI) accounts for a significant proportion of disability and death worldwide, with the majority of this burden affecting individuals in low- to middle-income countries. The current global approach to TSI care is inconsistent with considerable geographical differences, and limited data on the impact of these variations on outcomes.

**Methods:** NIHR-funded, international, multi-centre, prospective observational study. Any institution assessing patients with TSI was eligible to participate. All adults with radiologically confirmed TSI were included, in any given consecutive 30-day period. Each participating unit formed a study team responsible for gaining local approval, identifying patients for inclusion, and conducting data collection. Anonymised data is collected via an anonymised, secure online platform.

**Results:** 104 institutions worldwide have participated in GNOS Spine, with 1286 patients identified for inclusion. Data included relates to initial presentation, injury management, operative intervention if received, and short-term outcomes. The dataset, developed through an iterative feedback process involving clinicians from low and high Human Development Index countries, includes patient demographics, injury data, local management and, if applicable, timing and nature of surgery, post-operative care and immediate post-operative complications. The primary outcome measure is Frankel grade at discharge (or 6-weeks post-admission, whichever occurs first).

**Conclusions:** GNOS Spine provides a global snapshot of the case-mix, management, and short-term outcomes of patients with TSI. In addition, we identify areas for further study, and have established a clinical network to facilitate future research in global spinal trauma.



1382

## Trauma

ePoster presentation

### Posterior fossa trauma: management in a high volume neurotrauma unit

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**Objectives:** To determine the clinico-radiological profile and management of posterior fossa trauma in patients treated at a high volume neurotrauma unit.

**Background:** Traumatic posterior fossa lesions are very rare, representing less than 3% of traumatic lesions. The volume of the posterior fossa is small and hence traumatic lesions may cause early deterioration and herniation resulting in increased morbidity and mortality. Treatment strategies are variable.

**Methods:** Retrospective review of patients diagnosed with posterior fossa trauma treated in the neurotrauma unit at Inkosi Albert Luthuli Central Hospital, Durban between January 2013 and January 2023. We analyzed demographics, clinical characteristics, mechanism of injury (MOI), CT scan findings, management and Glasgow outcome scale (GOS) at discharge.

**Results:** A total of 85 patients met inclusion criteria. Seventy-five (88.2%) were males. The mean age was 25.96 years (range 6 months to 68). Children made up 33% of the study population. Median GCS was 13. The MOI was due to assault (47%), motor-vehicle collisions (22.3%), falls (19%) and pedestrian-vehicle collision (11,7%). CT brain scan revealed extradural haematomas (74%), cerebellar haematoma (23%) and subdural haematoma (3,5%). Associated hydrocephalus was diagnosed in 13% of the cases. Seventy-two (85%) patients were treated surgically and the rest were managed conservatively. Nineteen (22%) patients had unfavourable outcome (GOS 1 to 3) while 78% of patients had favourable outcome (GOS 4 to 5). The mortality rate was 13%.

**Conclusions:** Extradural haematomas are the commonest lesions diagnosed following posterior fossa trauma. Posterior fossa traumatic haematomas are frequently treated surgically.

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## Epilepsy

Oral presentation

### Endoscopic epilepsy surgery

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**Objectives:** Improving the results of surgical treatment of epilepsy using minimally invasive endoscopic methods.

**Background:** Resistant epilepsy remains one of the most difficult problems of modern neurosurgery. Improving the quality of life after epilepsy surgery makes it necessary to find safer and less invasive methods of surgical treatment. Endoscopy and combination of surgical methods is one of the areas of minimally invasive neurosurgery. Our experience in the treatment of epilepsy using endoscopic techniques is presented.

**Methods:** A retrospective analysis of 233 surgical interventions using endoscopic and combined methods in patients with epilepsy was carried out at the Federal Center of Neurosurgery in Tyumen for the period from April 2014 to April 2023. The mean age of the patients was 10.5±3.75 years.

**Results:** All operations are divided into 3 groups.

The first group consisted of microsurgical operations using endoscopic assistance which included such procedures as microsurgical callosotomy with endoscopic commissurotomy (n=162), microsurgical functional hemispherotomy with endoscopic assistance (n=6).

In the second group, we identified purely endoscopic operations through bure holes. We referred to these operations as endoscopic callosotomy and commissurotomy (n=23), endoscopic removal hamartoma (n=3), endoscopic disconnection hamartoma(n=1), endoscopic laser vaporization hamartoma (n=12), endoscopic fornicotomy and amygdalotomy(n=14), endoscopic functional hemispherotomy (n=4).

In the third group, we included endoscopic operations combined with stereotactic surgery. We referred to these operations as stereotactic laser amygdalotomy and endoscopic laser fornicotomy (n=4), endoscopic transventricle ganglioglioma removal using stereotactic control (n=1), stereotactic callosotomy with endoscopic commissurotomy (n=4).

**Conclusions:** Endoscopic surgical treatment of epilepsy is an effective and safe method of treatment and requires further development. Endoscopic technologies in combination with stereotactic laser ablation increase the radicality of the operation. Surgeon learning curve.

## Paediatric

ePoster presentation

The pre-operative role of antibiotic prophylaxis in myelomeningoceles: a single centre review of practice and literature review

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**Objectives:** To evaluate the use of antibiotic prophylaxis prior to post-natal myelomeningocele closure and to compare our practice to the currently published literature on this topic.

**Background:** There is a theoretical risk of infection in patients who have open neural tube defects prior to their surgical closure. We have observed that there is a wide variety in practice both nationally and internationally.

**Methods:** Outcome data retrospectively analysed for consecutive children undergoing myelomeningocele closure from January 2018 to 2023. Data was collected on demographics, myelomeningocele subtype, use of antibiotics pre- and peri- and post-operatively and surgical techniques. We reviewed whether patients developed wound and/or neurological infections.

**Results:** Ten patients underwent closure over a five-year-period. Post-natal closure was performed on day one post-partum in 50% of cases, with the average time-to-surgery being 1.4 days (range 0-3 days). Five patients received pre-operative intravenous antibiotic prophylaxis (n=3: Benzylpenicillin and Gentamicin; n=1 Cefotaxime; n=1 Flucloxacillin). Antibiotics were administered at induction in all cases – the specific antibiotics administered were only documented in 70% of cases (n=5 Benzylpenicillin and Gentamicin; n=1 Ceftazidime; n=1 Flucloxacillin). Betadine prep was used intra-operatively in eight patients, Cetrimide was used in one patient and saline alone was used in one patient. Two patients had ventricular access devices sited at their primary surgery.

One patient developed a post-operative wound infection requiring antibiotic treatment and subsequent surgical debridement. He had an extensive lumbosacral myelomeningocele, requiring a bilobed flap to close his defect at the primary procedure. He received antibiotic prophylaxis pre-operatively which continued post-operatively until his intra-operative wound swabs were negative. His wound infection subsequently developed.

No patients developed a neurological infection.

**Conclusions:** A variety of pre-operative practices were observed within this review. Our patient numbers are low and should be treated with caution. However, our findings do not support a clear role for antibiotic prophylaxis pre-operatively.

1386

## Paediatric

Oral presentation

The transition from paediatrics to adult services for patients with spinal dysraphism: areas for improvement

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**Objectives:** Our primary objective was to evaluate challenges faced by patients, their families and clinicians during the transition process. Our secondary objective was to assess ways in which we could improve the service we provide.

**Background:** Patients with Spinal dysraphism have complex medical needs requiring multidisciplinary input. In our centre, a paediatric multi-disciplinary clinic has been providing this service for the past 25 years. There is no parallel service dedicated to adults in our region, with patients and their families potentially feeling abandoned once discharged from Paediatric services. Transition from Paediatric to Adult services is a well-recognised period of heightened risk.

**Methods:** Observational cross-sectional quality improvement project evaluating 34 patients who were either participating in our regional Transition Spinal Dysraphism Clinic or had transitioned within the prior two years. Standardised questionnaires evaluated patient and clinician views, including perceived challenges in the Adult setting and areas for improvement.

**Results:** 20 patients were male and 14 were female. 16 (47%) required  $\leq 3$  adult departments for transition. All these patients were ambulant. 18 (52%) required complex transition involving  $>3$  specialities. Of this group, 14 patients were wheelchair bound.

Patients concerns included fear about the change of environment, a perceived loss of control and anxieties related to funding and care accessibility. Carers reported lack of support and being unsure who to contact when health issues arose. Clinicians highlighted concerns about the lack of a complex neuro-disability team with suitably-trained practitioners, increased demands on GPs and lack of physiotherapy services. We plan to discuss the specific feedback received and suggestions for improvement in more detail during our presentation.

**Conclusions:** We have evaluated the experience of patients with Spina Bifida undergoing the transition process. Our questionnaire highlighted critical areas requiring attention and helped us to identify areas for improvement and action in both the primary and secondary care settings.

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## Trauma

Oral presentation

### Outcome following penetrating traumatic brain injury in elderly patients

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#### **Objectives:**

The purpose of this study was to determine the clinico-pathological profile of penetrating traumatic brain injury (TBI) in elderly patients ( $\geq 65$  years) following assaults. The authors sought to identify risk factors associated with mortality.

**Background:** South Africa's (SA), population of 60,1 million, has a median age of 28 years. The elderly are 9% of population. There is dearth of information regarding the clinico-pathological profile and outcome of penetrating TBI in elderly patients.

**Methods:** Retrospective study performed in the Department of Neurosurgery, Inkosi Albert Luthuli Central Hospital, Durban. Study period was between January 2003 and December 2022. The data collected included demographics, clinical characteristics, weapon used, CT findings and management. We determined factors associated with in-hospital mortality.

**Results:** Thirty patients were analyzed. Median age was 68 years ( $p = 0.532$ ). Males were the commonly affected (56,6%), ( $p = 0.705$ ). Seven (23,3%) patients presented with underlying medical conditions ( $p = 0.184$ ). The weapons used were machete (13), gun (7), garden tool (4), axe (3) hammer (1), bottle (1), knife (1). Median GCS was 14. Clinical findings included neurological deficits (56%), ( $p = 0.017$ ) and seizures (3,3%), ( $p = 1,00$ ). CT brain scan findings were intracerebral haematoma (30), pneumocephalus (18), subarachnoid haemorrhage (10), intraventricular haemorrhage (5), effaced basal cisterns (4), extradural haematoma (4) and subdural haematoma (4). Two patients were diagnosed with post traumatic intracranial empyema ( $p = 0,540$ ). The mortality rate was 10%. Dilated pupil ( $p = 0.007$ ), GCS  $\leq 8$  (0,002), basal cistern effacement ( $p = 0,008$ ), gunshot injuries ( $p = 0,017$ ), admission into ICU (0,002) and pneumonia (0,031) were factors associated with mortality.

**Conclusions:** This is one of few studies to characterize penetrating TBI in elderly patients. The findings are important for planning intervention strategies aimed at improving outcomes. These findings have important clinical implications for adapting practice the increasing elderly population in SA.

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## Trauma

Oral presentation

Comparison of computer designed patient specific titanium implant cranioplasty with titanium mesh with PMMA cranioplasty - a retrospective study

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**Objectives:** To compare the results of Computer designed Patient Specific Titanium implant Cranioplasty with Titanium mesh with polymethylmethacrylate Cranioplasty.

**Background:** Cranioplasty can be done by using various types implants such as autologous bone, polymethylmethacrylate, Titanium mesh, Titanium mesh with polymethylmethacrylate and Patient specific implants made of Titanium or polymethylmethacrylate or Hydroxapatite.

**Methods:** From January 2014 to January 2023, a total of 174 cranioplasties were done at our neurosurgery department. Out of which, 117 cranioplasty were done from 2014-2019 using Titanium mesh with methylmethacrylate and from January 2020 to January 2023, 57 cranioplasty were done using computer designed Patient Specific Implant.



**Results:** Comparing the results of both surgeries, wound infection occurred in 13 patients with Titanium Mesh with polymethylmethacrylate cranioplasty and 2 patients with Patient specific implant cranioplasty. Wound gaping occurred in 9 patients with Titanium Mesh with polymethylmethacrylate cranioplasty and nil in Patient Specific Implant cranioplasty.

Implant exposure occurred in 7 patients with Titanium Mesh with polymethylmethacrylate cranioplasty and nil in Patient Specific Implant cranioplasty. Implant removal was done in 7 patients with Titanium Mesh with polymethyl methacrylate cranioplasty and 1 patient with Patient Specific Implant cranioplasty.

Visual Analog Scale for cosmesis with Titanium Mesh with polymethylmethacrylate cranioplasty was 67.6 and with Patient Specific Implant cranioplasty was 93.4.

Average Surgery time duration for Titanium Mesh with polymethylmethacrylate cranioplasty was 192 minutes and for Patient Specific Implant cranioplasty was 146 minutes. P value was statistically significant for less wound infection in Patient Specific Implant group.

**Conclusions:** Patient Specific implant cranioplasty had less wound infection, less surgery time and with better cosmesis after surgery, negligible wound gaping and no implant exposure when compared to titanium mesh with methylmethacrylate cranioplasty.

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## Oncology

Oral presentation

Unraveling the intricacies of brain network connectivity in primary and secondary brain tumors: a machine-learning-based exploratory analysis of Large-Scale Network

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**Objectives:** We aim to investigate the impact of primary and secondary brain tumors on large-scale brain networks and higher cognitive functions, utilizing machine-learning-based analysis of preoperative MRI imaging data.

**Background:** Patients with primary and secondary brain tumors often experience alterations in large-scale brain networks and higher cognitive functions.

**Methods:** In this retrospective study, we included patients who underwent brain tumor resection surgery at our institution. Preoperative MRI imaging studies, including T1-weighted and DTI sequences, were analyzed using a machine-learning-based platform. We categorized the integrity of nine major brain networks: language, sensorimotor, visual, ventral attention, central executive, default mode, dorsal attention, salience, and limbic. The brain network analysis was correlated with preoperative clinical data.

**Results:** A total of 110 patients were included in the study. The central executive network was the most affected (49.09%), followed by the default mode network (42.72%) and dorsal attention network (31.82%). Patients with preoperative deficits exhibited a significantly higher number of altered networks prior to surgery (3.25 vs. 2.24,  $p < .001$ ) compared to patients without deficits. Although brain networks were more frequently affected in patients with primary brain tumors (30.09%) compared to those with secondary brain tumors (27.24%), the difference was not statistically significant. Interestingly, non-traditional eloquent areas were more commonly affected than traditional eloquent areas across all subpopulations examined.

**Conclusions:** Our findings demonstrate that large-scale brain networks are frequently impacted in patients with primary and secondary brain tumors, even in the absence of overt neurological deficits. Notably, non-traditional eloquent areas were more prominently affected than traditional eloquent areas in our study. Integrating non-invasive brain mapping techniques based on machine learning into clinical practice may provide valuable insights for preserving higher-order cognitive functions associated with these networks.



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## Paediatric

ePoster presentation

Aggressive pineoblastoma in a 12year old girl: a challenging management in Zaria Northern Nigeria: case report

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### Objectives:

- 1. To report how an aggressive pineal region tumour is managed in a low and middle income countries
- 2. To highlight the challenges encountered in managing such a patient
- 3. To report palliative measures to reduce disease burden

**Background:** Stereotactic biopsy followed by cytoreduction surgery and /or radiation therapy are the standard treatment for pineoblastoma. We are reporting a patient with aggressive and mixed pineal region tumour with a huge cystic component and multiple erosions of the overlying skull, who we treated with an initial aspiration, followed by ventriculoperitoneal shunt, open biopsy and could not afford radiotherapy.

**Methods:** Our patient is a 12 year old girl who presented with clinical features of raised intracranial pressure. Brain CT scan and MRI showed a huge mixed pineal region tumour with large cystic component, hydrocephalus and multiple overlying skull erosions. She was resuscitated and had an initial cyst aspiration. However, repeat MRI after 14days showed re-accumulation of the cyst and patient had a ventriculoperitoneal shunt plus open cyst drainage and biopsy of the solid component which showed pineoblastoma. She was referred for radiotherapy, however, her parents could not afford the treatment fee and patient was taken home instead.

**Results:** Following the surgery, patient's clinical state improved from an admitting GCS of 10/15 to 14/15. At 2 months follow up via phone call, patient was said to be ambulating, communicating well and not requiring assistance in self-care.

**Conclusions:** Though the follow up period is very short and patient could not afford radiotherapy, the palliative surgical interventions resulted in reduction of disease burden.

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## Neurovascular Surgery

ePoster presentation

Retrospective review on the management of intracranial aneurysms in Johannesburg, South Africa

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**Objectives:** To assess the incidence and treatment methods used to treat patients with giant intracranial aneurysms who presented to the Chris Hani Baragwanath and Charlotte Maxeke Johannesburg Academic hospital's neurosurgical departments from the 1st of January 2021 to the 12th June 2023

**Background:** The Chris Hani Baragwanath and Charlotte Maxeke Johannesburg Academic Hospitals form the cornerstone of the University of Witwatersrand's Neurosurgical academic program, and represent a big referral center for neurosurgical related health services not only in Johannesburg but also the North West province. This study was conducted to assess the incidence of giant intracranial aneurysms and the treatment modalities provided in these high volume resource constrained centers.

**Methods:** Data was collected by systematically assessing the admission registries in the neurosurgical general wards and intensive care units, along with the neurosurgical theatre and neurovascular post procedural notes, to review the treatment modality provided for each case.

**Results:** A total of 26 Giant intracranial aneurysms were recorded during the time period with the majority located along the internal cerebral artery (69%).

A total of 16 (62%) were treated, and 10 (38%) were managed conservatively. Of the 16 treated, 13 (81%) were treated by endovascular intervention with flow diversion 5 (38%) and coiling 5 (38%) being the main methods used, and 3 (19%) were treated by surgical clipping.

**Conclusions:** The majority of giant intracranial aneurysms were located in the ICA region, specifically the cavernous ica segment. The majority of the cases were treated by endovascular intervention with flow diversion and coiling being the main methods used.

This study provides insight into treatment options offered for giant intracranial aneurysms in a resource constrained setting, and serves as a building block for future studies which aim to review treatment modalities offered for these conditions in similar settings.

## Education, Ethics, Socioeconomic

ePoster presentation

Pott Puffy tumour with massive subperiosteal abscess in a teenager: a rare clinical scenario in Zaria Northern Nigeria: case report

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### Objectives:

- 1. To report how Pott Puffy tumour can present with massive subperiosteal abscess
- 2. To highlight the challenges encountered in managing such a patient
- 3. To report how successful Pott Puffy Tumour can be treated

**Background:** Pott puffy tumor (PPT) is a localized forehead swelling with underlying subperiosteal abscess formation and osteomyelitis of the frontal bone. It is a rare complication of frontal sinusitis. Early diagnosis and prompt treatment is necessary to avoid severe neurological complications and sequelae. Treatment requires antibiotic therapy and often surgical drainage/debridement. Pott puffy tumor is now relatively uncommon and associated massive subperiosteal abscess formation is unusual. Here, we present a patient who presented with clinical features of Pott Puffy Tumour following an episode of acute sinusitis with no neurological deficit. He was treated with intravenous antibiotics, surgery and continuation of antibiotics.

**Methods:** Our patient is a 19 year old man who presented with headache, generalised tender scalp swelling, prominent on the left frontal region with occlusion of the left eye and fever following an episode of acute sinusitis with no neurological deficit. Craniofacial CT scan showed diffuse subperiosteal abscess, frontal bone osteomyelitis, left frontal epidural and subdural abscesses. He was resuscitated and had drainage of the abscess, sequestrectomy of the affected frontal bone, followed by 2 weeks of intravenous broad spectrum antibiotics, then oral antibiotics for another 4 weeks.

**Results:** He recovered fully and was discharged home to continue the oral antibiotics. At 2 months followed up, he had returned to his pre-morbid life without any sequelae.

**Conclusions:** Though the follow up period was very short but the early diagnosis and prompt intervention achieved the goal of a successful treatment of Pott Puffy Tumour in a teenager to return to his active pre-morbid life.

1395

## Oncology

ePoster presentation

Endovascular adjuncts to neuro-oncology management: single centre experience in Kenya

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**Objectives:** Review of the application of endovascular techniques in cranial oncology cases and reviewing outcomes including complications.

**Background:** The evolution of endovascular techniques have enabled better operative planning, reduced blood loss and minimally invasive techniques in neuro-oncology. We report on our first 7 year experience in the pioneer centre in our country.

**Methods:** Retrospective review from 2016-2023 of neuro-oncology patients that were investigated or managed in our endovascular suite. We reviewed indications, outcomes and any complications.

**Results:** There were a total of 12 cases with a mean age of 45.75years (28-63years). The male to female ratio was 3:9. The involved the following pathologies meningioma (2), chordoma (1), Nasopharyngeal adenocarcinoma (1), Hemangioblastoma (3) and paraganglioma (5). 2 procedures were digital subtraction angiograms with the rest being embolization of varying degrees. There were no intraprocedural complications. The cases were followed by surgery (5), radiotherapy alone (3) and surgery with radiotherapy (2).

**Conclusions:** Endovascular adjuncts to tumour management is well tolerated and should be considered.

1397

## Endovascular Neurosurgery

Oral presentation

No weekend effects on mortalities in patients receiving clipping or coiling for ruptured aneurysmal subarachnoid hemorrhage in Thailand

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**Objectives:** To identify if there was a weekend effect regarding outcome for the treatment of aneurysmal subarachnoid hemorrhage.

**Background:** For ruptured aneurysmal subarachnoid hemorrhage (aSAH), treatments may not be readily available around the clock. This study aimed to estimate the weekend effect and hospitalization conditions on 30-day and 90-day mortalities among patients receiving surgical clipping or endovascular coiling in a national insurance of Thailand.

**Methods:** Hospitalization data in 2009-2020 of 8,345 patients with aSAH  $\geq 18$  years who received clipping or coiling were obtained from the Universal Coverage Scheme. The effects of weekend admission and hospitalization conditions were estimated using a mixed-effects, Weibull survival analysis, controlled for treatment procedures, demographics, medical conditions, and geographic areas.

**Results:** Majority of patients aged  $< 60$  years (57.6%), was female (64.5%), had hypertension (65.4%), and was hospitalized in non-university settings (55.0%). Almost one-third (30.5%) were admitted on weekends and 90.0% underwent clipping. Observed 30-day and 90-day mortalities respectively were similar between the weekday and weekend groups (17.8 and 22.5 vs. 18.1 and 23.4%) and were higher in the non-university group (24.6% and 29.8%) than in the university counterparts (9.8 and 14.2%). The adjusted hazard ratio (HR) with its 95% confidence interval on 30-day and 90-day deaths were 1.00 (0.90-1.12) and 1.02 (0.93-1.13), respectively for weekend admissions and were 0.42 (0.32-0.55) and 0.50 (0.39-0.64), respectively for the university hospitals. The 30-day and 90-day mortalities exhibited a decreasing trend over the hospitalization periods (21.4 and 25.5 in 2009-2011, 18.8 and 23.6 in 2012-2014, 17.8 and 23.1 in 2015-2017 and 15.9 and 20.7%, in 2018-2020; test for trend,  $p < 0.001$ ).

**Conclusions:** There were no weekend effects on the 30-day and 90-day mortalities in patients treated with clipping or coiling for ruptured aSAH. The mortalities, however, were associated with hospital types and hospitalization periods.

1398

## Global Neurosurgery

Oral presentation

Neurosurgical education in Andean Latin America: assessment of neurosurgical anatomy teaching disparities

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**Objectives:** To investigate the volume and disparities of neurosurgical anatomy teaching within residents of Andean Neurosurgical trainees and determine its impact in academic excellence.

**Background:** Neurosurgical training in Andean Latin America is based on clinical exposure through service-based education model. A neurosurgical training curriculum is exceedingly rare and not fostered nor regulated by organized neurosurgery. Academic activities in neurosurgical teaching institutions are not routinely maintained and are exceedingly rare. The current teaching volume of neurosurgical anatomy during training in Andean Latin America is unknown and so is its effect in academic excellence.

**Methods:**

A group of 150 neurosurgical trainees ( up to 5th year practicing neurosurgeons, year 2022) representative of all Andean Latin American countries (capital, urban and rural hospitals) were asked to participate in a web-based neurosurgical anatomy knowledge assessment. Assessment scores were classified into tiers of excellence (subpar, basic, advanced, connoisseur). Participants were also surveyed on their academic experience during training (including neurosurgical anatomy lectures provided by their programs).

**Results:** A total of 132 (88%) representing all Andean Latin America participated. Most participants (61%) received <5 neurosurgical anatomy lectures in their training. Only 13% of participants had > 10 lectures. Most urban residents (85%) had <5 lectures at the time of the survey. Most (71%) participants who received >10 lectures during their training were from capital programs. Trainees from urban programs had less neurosurgical anatomy lectures than their capital counterparts,  $p<0.01$ . Senior residents from capital programs had dramatically more lectures (52%  $n>5$ ) than their urban colleagues (11%  $n>5$ ),  $p=0.01$ . No rural neurosurgeons had >10 lectures during their training. The number of neurosurgical anatomy lectures correlated strongly with the tier of excellence in the knowledge assessment,  $r=0.69$ ,  $p<0.01$ .

**Conclusions:** There is a global neurosurgery need to improve neurosurgical anatomy teaching inequalities in Andean Latin America. Exposure to neurosurgical anatomy lectures strongly correlated with academic excellence.

1399

## Trauma

ePoster presentation

### Decompressive craniectomy in traumatic brain injury: an institutional experience of 131 cases in two years

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**Objectives:** To analyze sociodemographic, clinical, and surgical characteristics associated with the prognosis of patients who underwent decompressive craniotomy to treat traumatic intracranial hypertension (ICH) at the Restauração Hospital (HR) in Recife, Brazil between 2015 and 2016, and to compare the clinical features with surgical timing and functional outcome at discharge.

**Background:** TBI is one of the main unresolved health problems worldwide, and is an endemic disease in low-and middle-income countries. Decompressive craniectomy (DC) effectively reduces intracranial pressure, but is not considered to be a first-line procedure.

**Methods:** A retrospective, descriptive, and observational study was performed using the HR hospital database. After obtaining hospital ethics committee approval medical records for all patients with TBI who were submitted for DC at HR between January 2015 and December 2016 were assessed.

**Results:** A significant majority of the patients were young adults (age 18-39 years old; 75/131; 57.3%) and male (118/131; 90.1%). Road traffic accidents, particularly those involving motorcycles (57/131; 44.5%), were the main cause of the traumatic event. At initial evaluation, 63 patients (48.8%) were classified with severe traumatic brain injury (TBI). Pupil examination showed no abnormalities for 91 patients (71.1%), and acute subdural hematoma was the most frequently observed lesion (83/212; 40%). Glasgow Outcome Scale score was used to categorize surgical results and 51 patients (38.9%) had an unfavorable outcome. Only the Glasgow Coma Scale score on admission (score of 3-8) was more likely to be associated with unfavorable outcome ( $p$ -value = 0.009), indicating that this variable may be a determinant of mortality and prognostic of poor outcome.

**Conclusions:** Patients who underwent an operation sooner after injury, despite having a worse condition on admission, presented with clinical results that were similar to those of patients who underwent surgery 12 h after hospital admission. These results emphasize the importance of early DC for management of severe TBI.

1401

## Spine

Oral presentation

Spinal epidural hypertension as a determining factor in the disability of patients with lumbar spinal stenosis: 1-year follow up period

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**Objectives:** To determine the relationship between patient's symptoms and Epidural Pressure Values. (EPV). To determine the relationship between EPV and Spinal-Canal Cross Sectional Area (SCCSA) and Dural-Sac Cross Sectional Area.(DSCSA).

**Background:** Lumbar Spinal Stenosis (LSS) is a major medical concern due to its high prevalence among elderly and its impact on patient's quality of life. Multiple studies (Mariconda; Boden; Schonstrom;Matsumoto; Herno; Webber.) have not found a relationship between the widening of the spinal canal and improvement of symptoms. Neurogenic compression and vascular hypoxia of rootlets tried to explain LSS pathophysiology. We propose to include Epidural Hypertension (EH) as a new theory that explains dynamic stress of neural structures in this disease and its intimate relationship with the genesis of the patient's symptoms.

**Methods:** Two Groups.

A:LSS diagnosed by MRI.(n=6).

B: Patients undergoing spinal surgery for other diagnosis (WLSS) (i.e:spinal cord stimulation). (n=5) LSS patients underwent laminectomy as standard of treatment. Previously, careful dissection of flavum fibers was performed and pressure microsensors inserted into epidural space in stenotic segment. Pressure was measured in 0° and then 50° surgical-table-extension in order to extrapolate EPV to standing position. SCCSA and DSCSA were measured in pre-operative MRI. 1-year follow-up period including VAS, ODI and JOA scales was performed.

**Results:** We found statistically significant differences between EPV in LSS and WLSS in both 0° (p=0.005) and 50° (p=0.006).1-year VAS,ODI,JOA evidenced significant and sustained improvement (p=0.042;0.045;0.045) with a JOA mean recovery rate of 49%. In our cohort we did not find relationship between symptoms and SCCSA and DSCSA, however we found a strong correlation between EPV and SCCSA (0° Rho:-.809)(50°: -.833) and DSCSA (0° Rho:-.775)(50°: -.850). We found a tendency to correlation between pre-operative ODI and 0°EPV. (Rho:.698).

**Conclusions:** EH may play a fundamental role in dynamic stress of neural structures in LSS contributing to mechanical compression and vascular hypoxia. EH could be a determining factor for disability and could be considered a special treatment target in patients with LSS.



1402

## Hydrocephalus

ePoster presentation

Sylvian fissure size as a predictor of hydrocephalus type in paediatric TB-meningitis

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**Objectives:** To investigate whether the Sylvian fissure size can accurately predict the Hydrocephalus Type in TB-Meningitis.

**Background:** TB infection occurs in approximately 2 billion people globally with 20% of TB-related deaths occurring in children. Central nervous system TB is rare with a high morbidity and mortality and hydrocephalus is a common complication. TB-Meningitis hydrocephalus can be communicating or non-communicating and the hydrocephalus type influences the management of the patient. Currently the gold standard to distinguish between the types is performing an air-encephalogram. Previous studies have unsuccessfully evaluated CT scan features to differentiate between the two. However, none of these assessed the Sylvian fissure size to determine hydrocephalus type.

**Methods:** Data was prospectively collected. Patients with laboratory confirmed TB-Meningitis between the ages 6 months and 14 years were included. Air-encephalogram determined the hydrocephalus type of 60 patients (30 communicating, 30 non-communicating). Blinded to air-encephalogram results, investigators (Neurosurgeon, Paediatric Neurologist, Radiologist) reviewed the patients' CT scans in random order twice, 4 weeks apart using Sylvian fissure size to determine Hydrocephalus Type. Intra- and inter-reviewer accuracy was reviewed.

**Results:** Accuracy in Hydrocephalus Type at initial assessment and 4 weeks was 53,33% and 51,7% for the Neurosurgeon, 56,67% and 58,3% for Paediatric Neurologist and 58,33% and 50% for the Radiologist. Using the size of the Sylvian fissure to differentiate between the 2 types of hydrocephalus appeared random with low inter- and intra-observer reliability.

**Conclusions:** To date there is no reliable CT scan feature that can accurately determine the type of hydrocephalus in TB-Meningitis. Air-encephalography remains the gold standard and despite its known complications, it remains a useful investigation to guide therapy in the management of hydrocephalus in TB-Meningitis.

1403

## Neurovascular Surgery

ePoster presentation

GALENO: theoretical neurosurgery device

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**Objectives:** "Galeno" is a theoretical medical device that I created completely on my own for patient's with severe stroke and herniated brain. The design of this device combines: neurosurgery, neurotechnology, drug delivery and modern knowledge of biomedical science. The aim is to reduce cerebral edema and optimize homeostasis. More than 27 million people worldwide are affected by TBI each year. Galeno is placed on the brain via a decompressive craniectomy (DC) and has the shape of a helmet to both protect brain and monitor it until cranioplasty.

**Background:** 1. Galeno is placed on the site of patients undergoing DC to monitor and contain swelling, reduce inflammation, monitor the parameters (es. ICP, blood pressure, etc)  
2. Galeno can monitor for electrographic brain functions as well as be a mechanism to, intervene directly with the use of drugs.  
3. reduce hospital stay and improve the patient's quality of life.  
4. monitor infection, hemorrhage and other risks.

**Methods:** Galeno represents a Phase 0 (proof of concept) design for subsequent animal and early human (Phase I) testing. After animal data regarding feasibility and safety, I'm requesting approval for Phase I safety/tolerability testing.

**Results:** Galeno/helmet is provide a lattice structure to support injured/ischemic or TBI- brain. The device and helmet design are 3D printed (biocompatible polymers) and integrated with other components: brain computer interfacing, neuromonitoring and sensors, fluorescence, and a wireless system, with some subdural and fluid drainage. The purpose of this proposal is to seek early design feedback.

**Conclusions:** Galeno" is the result of a thorough and careful study of what makes it up and the pathology it is intended to counteract and I realized that It could also be used for other neurosurgical conditions: epilepsy, tumors, etc.

It has a lot of potential and could also find future applications in neuroscience and in space and military research.

## Neurovascular Surgery

ePoster presentation

Surgical management of trigeminal neuralgia facial pain syndrome: transcranial approach asterional route versus extracranial approaches

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**Objectives:** Experience and comparison of results of the transcranial asterional or retromastoid approach versus the extracranial approach for the surgical management of facial pain syndrome due to Trigeminal Neuralgia.

**Background:** Painful symptoms are among the main reasons for consulting the emergency area of the different health units. Various pathologies cause facial pain, and since this is a symptom whose assessment by the patient is subjective, it often represents a challenge for the health professional. The disorder known as Trigeminal Neuralgia (TN) is, without a doubt, one of the most intense painful conditions that a human being can suffer. TN is an entity that originates in the V cranial nerve (trigeminal) and constitutes 89% of all facial pain.

**Methods:** Field study, descriptive, non-experimental, prospective, and cross-sectional. A total of 17 patients with a diagnosis of Trigeminal Neuralgia were operated on. Medical history, surgical findings, response to treatment, and complications were recorded. They were followed for 3, 6 and 12 months in the period from January 1, 2019, to September 30, 2020.

**Results:** Vascular etiologic were AICA (N = 2 [11.7%]), PICA (N = 3 [17.6%]) SUCA (N = 4 [23.5%]), Basilar vertebral dolichoectasia (N = 1 [5.88%]), combinations of AICA + PICA (N = 3 [17.6%]) and AICA + SUCA (N = 4 [23.5%]). A predisposition towards the right side was observed with a total of 9 patients (52.9%) in relation to the left with 8 patients (47%). The most affected branch was the combination of V2 and V3 with 12 (70.5%) patients, and combination of V1, V2 and V3 with 2 (11.7%) patients.

**Conclusions:** Extracranial surgery is an alternative with similar results to the transcranial approach, it adds the benefits of a surgical technique with less trans and post-surgical morbidities. Microvascular decompression being an effective surgical procedure of choice.

1407

## Spine

Oral presentation

Spinal arachnoid cyst: case series, a single centre experience

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**Objectives:** Our aim is to illustrate presentation, management, and outcome of patients at our centre.

**Background:** Spinal arachnoid cyst (SAC) are rare lesions, which mainly presents with pain and are having a challenging and controversial management.

**Methods:** Twenty-three patients of SAC admitted to our centre in last 13 years and treated surgically were included. We analysed the patients in terms of clinical features, duration of symptoms, location, surgical procedure performed and outcome.

**Results:** Twenty-three patients were admitted and operated for SAC during last 13 years with a mean age of 37.17 years, with female to male ratio of 1.55:1. Most commonly patient presented with symptom of only backpain (12,52%), pain and paraesthesia (7,30.4%), weakness and incontinence (each 2, 8.69%). Mean duration of symptoms was 33.7 months. Three patients had history of trauma, one had history of spinal injection, one had congenital and one patient had history of meningocele operation at birth. On examination weakness and signs of myelopathy were detected in 10 and 9 patients respectively. The most common location of cyst was in dorsal region (15,65%), followed by dorso-lumbar region (4, 17%), purely lumbar in three and one had cyst at lumbosacral region. Cyst was intradural in 12 and extradural in 11 patients. Marsupialization and excision of cyst was done in 12 and 11 patients respectively. Ligation of dural connection was performed if found. Follow up was done for an average of 6.6 months. One patient developed weakness post operatively, One had delayed wound infection and one patient had recurrence.

**Conclusions:** Pathophysiology of SAC is not completely understood. MRI is investigation of choice and can demonstrate the location and communication site between cyst and arachnoid space. Surgical exploration is the treatment of choice and is well tolerated and provide the best outcome.

1409

## Skull Base

Oral presentation

### Reconstruction of surgical defects in spheno-orbital meningioma surgery

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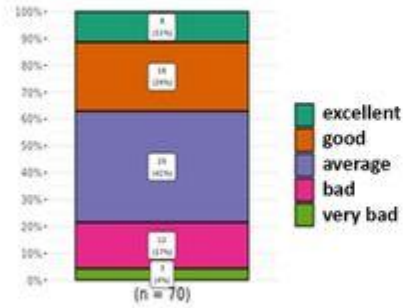
**Objectives:** To evaluate the effectiveness of various methods of reconstruction of soft tissue and bone defects in spheno-orbital meningioma surgery.

**Background:** Hyperostotic spheno-orbital meningiomas is a complex pathology that requires a multidisciplinary approach. One of the challenges of spheno-orbital meningioma surgery is adequate reconstruction of dura and single-step reconstruction of the orbital walls after tumor removal. Nowadays the technique of dura closure with various autologous flaps has been worked out, and a large number of artificial materials have been created. At the same time, the need of orbital walls reconstruction is still a matter of debate.

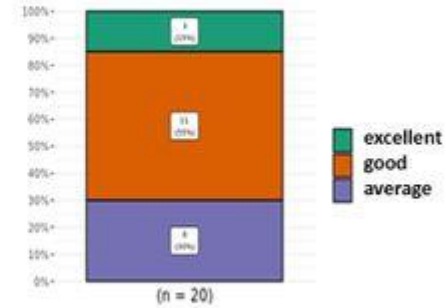
**Methods:** We analyzed 93 cases of primary operated patients with hyperostotic spheno-orbital meningiomas for the period from 2017 to 2022 at the Burdenko Neurosurgical Center. The impact of materials and methods of reconstruction of soft tissue and bone defects on the risk of postoperative complications, functional and cosmetic results was assessed.

**Results:** Localization and sizes of bone defects of the orbital walls do not have a significant effect ( $p < 0.05$ ) on ophthalmological symptoms in the postoperative period. The use of the periosteum as a material for the dura defect reconstruction is accompanied by a low frequency of post-operative complications (4%). The probability of complications does not correlate with the use of different sealing agents. When analyzing the dynamics of the position of the eyeball, significant differences were obtained depending on the volume and method of reconstruction of the orbital walls defect ( $p = 0.001$ ). When analyzing the cosmetic outcomes of treatment, the best results were obtained in the group where individual implants were used to reconstruct the orbital walls ( $p = 0.013$ ).

How would you rate your appearance?  
(group without 3D reconstruction)



How would you rate your appearance?  
(group with 3D reconstruction)



**Conclusions:** Reconstruction of the orbital walls after removal of speno-orbital meningiomas using individual 3D implants provides better functional and cosmetic results in comparison with classical surgical techniques.

1414

## Skull Base

Oral presentation

Keyhole endoscopic assisted microsurgery paramedian supra-cerebellar infratentorial approach for resection of pineal region tumors

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**Objectives:** The pineal region lesions have heterogeneous histopathological features, and their surgical removal is technically challenging due to the anatomic complexity and their proximity to critical structures. The ideal approach to this region continues to be controversial.

**Background:** We present our experience in management of lesions in this region using endoscopic assisted microsurgical technique via keyhole paramedian supra-cerebellar infratentorial approach.

**Methods:** Retrospective study assessing all patients with pineal region lesions during the period between 2008 to 2022 who underwent resection using a keyhole paramedian supracerebellar infratentorial approach. The outcomes were assessed using Glasgow Coma Scale (GCS) and modified Rankin scale (mRS).

**Results:** Out of 37 patients recruited, 57% males, 43% females. The mean age 35.81years. Blurring of the vision and Perinaud's syndrome were encountered in 75% and 12.5% of the cases, respectively. Ten (31.25%) patients had hydrocephalus at presentation; five of them underwent external ventricular drain and five underwent endoscopic third ventriculostomy. Gross total excision was achieved in 33 (90%) patients. The mean duration of surgery was 3.5±0.4 (3-4.5) hours. Postoperatively 10 Pts. had diplopia most recovered, 2 Pts. developed CSF leakage only one patient (3.13%) required a permanent shunt. All patients had a favourable clinical and functional outcome at discharge and at a six-month follow-up visit.

**Conclusions:** Keyhole paramedian supracerebellar infratentorial approach for the pineal region lesions should be considered the approach of choice. It is minimally invasive, shorter duration, versatile, and uses natural corridors. Use of endoscopes leads to better visualization and enough exposure for safe dissection and removal of tumours. It eliminates or minimizes the need for retraction of the cerebellum or occipital lobe and carries a low incidence of postoperative complications.

1415

## Hydrocephalus

Oral presentation

Redesigning ventriculoperitoneal (VP) shunt valve: a novel biomedical initiative and perspective

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### **Objectives:**

We propose a new iteration of ventriculoperitoneal (VP) shunt valves, implementing 3D printing, innovative mechanical design and advanced sensors to reduce the costs and broaden the accessibility of

**Background:** VP shunt valves have been used to treat hydrocephalus since 1950. Since then, many shunt models were introduced into the market to combat a high failure rate. However, due to economical restrictions and limited materials, especially in developing countries, the decision which shunt valve to choose remains a dilemma.

**Methods:** The new design of the VP shunt is proposed, which uses 3D printing technology. The mechanical design relies solely on the fluid dynamics allowing for the optimal drainage of the cerebrospinal fluid (CSF) and to prevent backflow. It contains no moving parts, reducing the probability of mechanical failure. The sensors implemented into the valve monitor the flow rate and would allow for quick surgical intervention if needed, saving precious time in case of emergency.

**Results:** First tests were performed on the scaled-up, 3D printed prototypes. First shunt iteration tested only the concept of mechanical design, and failed, not showing significant differences in rate of drainage and backflow. Second iteration was a prototype with the system fixed into the shunt. Fluids of two different viscosities were used, but the results were inconclusive due to model maladjustment to testing. Further work is planned to optimise the prototype model and test it with pathophysiologically relevant viscosities of fluids.

**Conclusions:** By combining the simplicity of the mechanical design and the advanced technology of the sensors, the proposed redesigned VP shunt would be not only cheaper and more easily accessible thanks to the implemented 3D printing technology, but most importantly would allow for quick surgical intervention in case of emergency. We are looking at increasing the longevity of the new valve by introducing biocompatible material and incorporating state-of-the-art technology.



1416

## Spine

Oral presentation

Impact of histological diagnosis in exeresis and prognosis of intramedullary tumors: experience of 68 cases at speciality to hospital, Rabat

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**Objectives:** To analyze the impact of tumor histology on neurological outcomes in intramedullary spinal cord tumors.

**Background:** Intramedullary tumors (IMT) represent less than 5 % of all tumors of the central nervous system (CNS). Since the advent of microsurgical techniques, the ultrasonic dissector, and magnetic resonance imaging (MRI). Surgical outcomes for IMT are affected by many variables including tumor histology and preoperative neurological function. The surgical approach to IMT is no longer limited to a simple biopsy with radiotherapy but includes as wide a microsurgical excision as possible otherwise complete.

**Methods:** The analysis of the database of spine tumors of our institution made it possible to collect 68 cases operated from January 2000 until December 2022 including almost as many women as men. The average age of our patients was 29,1 years with extremes ranging from 4 years to 70 years. of the database of spine tumors from our institution has made it possible to collect 68 cases of IMT operated on from January 2000 until December 2022, comprising almost as many women as men.

**Results:** The most common tumor location was the location of the dorsal region. Surgical management included complete excision in 23 cases, subtotal excision in 10 patients, and biopsy in 6 cases. The majority of IMT were low-grade glial tumors essentially ependymomas (44,1%) and astrocytomas (16,1%). During the functional follow up it worsened in 8,8 % of cases, stating no change in 42,6% of cases and an improvement in 48,5% of patients. We also found that early management that is to say before the onset of major neurological deficits was a guarantee of better functional results.

**Conclusions:** The factors of good prognosis remain the histological diagnosis of the tumor. The neurological state which predicts the complete nature of the resection, and the postoperative state.

1417

## Trauma

Oral presentation

### Prognostic factors of chronic subdural hematoma

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**Objectives:** The aim of this study was to evaluate the prognostic factors of patients consulted for chronic subdural hematoma.

**Background:** it is a frequent neurosurgical pathology in the elderly whose treatment remains surgical to this day.

**Objective:** To analyze the prognostic factors of patients treated surgically for chronic subdural hematoma.

**Methods:** A series of 133 patients received at the Neurosurgery Department at Ibn Sina Hospital in Rabat, Morocco, for chronic subdural hematoma (CSDH). The hematoma was surgically evacuated in 131 patients and 2 patients did not undergo surgery. We analyzed possible prognostic factors such as age, sex, causes, preoperative radiological findings and preoperative neurological status.

**Results:** The most important prognostic factor for chronic subdural hematoma was preoperative neurological status. Age causes and preoperative radiological findings (CT scan aspects, hematoma compartmentalization) had a significant influence on outcome. Age and sex, on the other hand, had no influence.

**Conclusions:** The neurological status of patients at the time of diagnosis and treatment, and radiological analysis are the significant prognostic factors. Early diagnosis of chronic subdural hematoma before neurological deterioration is important.

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## Skull Base

Oral presentation

The endoscopic-assisted supraorbital approach for resection of tuberculum sellae meningiomas

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**Objectives:** Resection of Tuberculum sellae meningioma can be challenging due to the anatomical relationship of these tumors to the optic pathway and the carotid and anterior cerebral arteries. selecting the most appropriate approach is crucial for successful and safe tumor resection. An optimal approach should provide sufficient and early visualization of relevant anatomical structures and blood vessels, adequate working distance to the tumor and minimal brain retraction. The endoscopic-assisted supraorbital approach (eSOA) constitutes a minimally invasive strategy for removing anterior skull base meningiomas (ASBM).

**Background:** We present our experience of endoscopic-assisted supraorbital approach (eSOA) for Tuberculum sellae meningiomas resection, providing further insight regarding indication, surgical considerations, complications, and outcome.

**Methods:** We present 56 patients operated on Tuberculum sellae meningioma via eSOA over 15 years.

**Results:** 43 Pts presented with visual impairment (blurring of vision, restriction of visual field). total excision was achieved in 93% of cases (52 Pts). Complications included hyposmia (3.5%), supraorbital hypoesthesia (5%), cerebrospinal fluid fistula (2%), orbicularis oculi paresis (2%), visual deterioration (7%), Median follow-up was 4 years with a tumor recurrence rate of 7% (4 Pts.). Second surgery was chosen in 2 cases, whereas one patient received radiation and in one patient a wait-and-see strategy was adopted. Median surgery duration was 3.35 1.42 hours.

**Conclusions:** The eSOA represents an effective option for Tuberculum Sellae meningiomas resection, enabling high complete resection rates and long-term disease control. Endoscopy is fundamental for improving tumor resection while reducing brain and optic nerve retraction.

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## Spine

ePoster presentation

### Intradural and extramedullary Ewing's sarcoma

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**Objectives:** Shows a highly malignant bone tumor that most often affects the diaphyses of the femur and tibia. Discovered by chance.

**Background:** Ewing's sarcoma (ES) is a highly malignant bone tumor most frequent in the diaphyses of the femur and tibia. It is a highly undifferentiated, primary and malignant tumor with rare intradural and extramedullary localization.

**Methods:** We report the case of a 27-year-old girl without any particular history who presented with cervicobrachial neuralgia with heaviness of the upper limb for 6 days associated with right paresthesia of rapidly progressive onset, admitted conscious, GCS 15, 1/5 deficit in the distal right upper limb on muscle testing, associated with fever.

**Results:** MRI performed shows an intradural process extra medullary lateralized on the right with osteolysis of C3-C4 compressing the marrow evoking a PNET, the patient benefited from laminectomy of C3, C4, with a total removal of the lesion whose histology confirms the diagnosis of Ewing's sarcoma. The patient was referred to oncology for treatment.

**Conclusions:** Good clinical recovery postoperatively and no recurrence was observed on imaging. Extradural Ewing's sarcoma without bone involvement remains rare.

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## Endovascular Neurosurgery

ePoster presentation

Moyamoya disease revealed by a subarachnoid hemorrhage: a case report

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**Objectives:** Moyamoya disease revealed by meningeal hemorrhage.

**Background:** Moya- Moya disease (MMD) is a rare entity in neurological pathology with a poor prognosis. It is a chronic occlusive cerebrovascular disease characterized by progressive stenosis at the terminal portion of the internal carotid artery and an abnormal vascular network at the base of the brain.

**Methods:** 43 year old patient, with no previous pathological history, admitted with a frank meningeal syndrome followed by a disorder of consciousness. She was admitted with a GCS of 14 - 15, which was subsequently reduced to 10. She was hemodynamically and respiratory stable with a BP of 12/8 cm/Hg,

**Results:** 43 year old patient, with no previous pathological history, admitted with a frank meningeal syndrome followed by a disorder of consciousness.

She was admitted with a GCS of 14 - 15, which was subsequently reduced to 10. She was hemodynamically and respiratory stable with a BP of 12/8 cm/Hg, a respiratory rate of 16 cycles/min and a heart rate of 92 beats/min. Noncontrast brain CT showed subarachnoid hemorrhage with intraventricular flooding graded Fisher IV. A cerebral angio-CT ruled out aneurysm and arteriovenous malformation and dural fistulas and showed vascular thrombosis of the internal carotid artery. An EVG (external ventricular bypass) was placed. After three days of hospitalization in the intensive care unit, a cerebral arteriogram was performed showing vascular arrest in the right internal carotid artery in its pre-cavernous portion with absence of visualization of the right sylvian artery and the presence of several perforating cerebral artery and external carotid artery bypass systems suggestive of Moya Moya.

**Conclusions:** Moya Moya disease is a rare entity of unknown origin. The hemorrhagic manifestation is however rare and occurs in a subject young without risk factors. Cerebral angiography remains the gold standard for diagnosis.

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## Education, Ethics, Socioeconomic

Oral presentation

History of women in Brazilian neurosurgery: path of pioneer women and integration with the future

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**Objectives:** Recognize and identify the Brazilian female pioneers and their contributions to neurosurgery.

**Background:** The number of women in medicine has increased significantly in Brazil recently. However, they are still rarely portrayed in national medicine history books. Following great examples of neurosurgery giants: Victor Horsley and Harvey Cushing, both medical historians, this work aims to acknowledge the women who contributed and continue to contribute to Brazilian Neurosurgery, as a way of preserving the past and improving the future.

**Methods:** Interviews with Brazilian female neurosurgeons and literature review using "women in neurosurgery" in MEDLINE (via PubMed), Embase and BVS databases.

**Results:** In Brazil, since 2009, medical schools have graduated more women than men, however this reality is not seeing in all medical specialties, especially the surgical ones. In neurosurgery, although the percentage of women has increased, there is still a much large gap in gender with a male/female ratio of 9.6 (9.4% female and 90.6% male) in 2023. The interviews carried out unanimously indicated the difficulties and opportunities that female neurosurgeons had to improve the society where they were inserted. Their union, exchange, support and struggle opened doors for the current and future generations to have increased roles in leadership positions, from hospitals and medical residences to state, national and international entities.

**Conclusions:** Knowing and preserving the past is a key criterion for moving forward. The contribution acknowledgement of the female pioneers in Brazilian Neurosurgery is of extreme importance for the development of the specialty now and in the future. Their commitment and dedication, helped women today to perform their current functions and expand their activities to areas of leadership in Brazil and abroad, accompanying similar social changes around the world. However, there is still gap on gender equality. Therefore, there is a need to further encourage the entry of more female students in the area.

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## Hydrocephalus

ePoster presentation

Hydrocephalus and giant congenital nevus: about two cases and literature review

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**Objectives:** To report two cases of giant congenital nevi with neurological complications.

**Background:** If the Congenital Giant Nevus (CGN) is a rare entity, 1 in 4 children would have intracranial neurological damage. The involvement of the nervous system is varied and represents a risk of morbidity and mortality.

**Methods:** Observation 1: 12-month-old male infant, received for a macrocrania, with dermatological lesions of the right hemibody. On examination, there was a biparietal scar of congenital cutaneous aplasia, a delay in psychomotor development. The CGN extended over the entire right hemibody in the form of multiple hyper-pigmented patches with a rough surface, and satellite nodules at the right temple and eyelid. Cerebral MRI revealed hydrocephalus, a right fronto-temporal subarachnoid cyst, periventricular encephalomalacia, agenesis of the corpus callosum.

Observation 2: 7-month-old female infant received for macrocrania with dermatological lesions of the right hemibody. On examination, there was a delay in psychomotor development, impairment of III, and epilepsy. The CGN extended over the entire right hemibody in the form of multiple hyper-pigmented patches with a rough surface with hypertrichosis, satellite nodule of the left eyelid, bilateral keratitis. Cerebral MRI found significant hydrocephalus, vermian hypoplasia, cystic dilatation of the fourth ventricle.

**Results:** These two cases have features not described: hemicorporal localization, diversity and multiplicity of skin lesions, ophthalmic and peripheral nerve localization, associated cerebral malformations, which may be part of a syndrome. However, the assessment, in particular MRI, anatomo-pathological and genetic, could not be complete, not allowing us to define an entity. Early screening by MRI of the entire nervous system is recommended before six months. The treatment of the hydrocephalus depends on the results of examination. Radiation therapy may be indicated.

**Conclusions:** These two observations highlight the diagnostic difficulties in our work context, making it difficult to follow up on care.

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## Trauma

ePoster presentation

Nonmissile penetrating brain injuries by stab: Chad's experience and review of the literature

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**Objectives:** To describe the epidemiological and clinical, images finding, To evaluate the management and the follow up of nonmissile penetrating brain injuries by stab at the University Hospital La Renaissance of Ndjamen, Chad.

**Background:** Nonmissile penetrating brain injuries by stab are rare and the vulnerating objects involved are varied.

**Methods:** It were a descriptive and retrospective study over 58 months in the neurosurgery unit from September 2017 to June 2022. We reviewed 16 cases during all the study period.

**Results:** The average age is  $32.19 \pm 13.17$  years, the age group from 21 to 40 years old was the most affected (68.8%). All of our patients were male. Cultivators and breeders accounted for 31% and 25% respectively. Fights account for 81.2% of cases. The machete (25%), the stick (25%) and the arrow (12.5%) were the most objects frequently observed. Wounds without (62.5%) and with intracranial object (25%) and altered consciousness (43.8%). Barrier fractures (43.75%), comminuted fractures (31.25%), vulnerating intraparenchymal objects (25%) and pneumencephaly (25%) were the most observed CT lesions. The left fronto-parietal (25%), right frontal (18.8%) and right temporal (12.5%) regions were the most affected. All patients had received medical treatment. Surgery was performed in 15 cases (93.8%). The immediate follow up after surgery was favorable in 87.5%, stationary in 6.25% and complications in 6.25%.

**Conclusions:** Nonmissile penetrating brain injuries by stab are frequent in Chad linked to an upsurge in farmer-herder conflict. Urgent surgery leads to good results.



## Endovascular Neurosurgery

ePoster presentation

### Subarachnoid hemorrhage secondary to cerebellar pial arteriovenous fistula: a case report and literature review

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**Objectives:** To report a case of cerebellar pial arteriovenous fistula and a literature review.

**Background:** A 57-year-old hypertensive female patient was referred from another service with a diagnosis of subarachnoid hemorrhage and acute hydrocephalus. She underwent external ventricular drainage and was admitted with a Hunt-Hess score of 3 and Fisher grade 4. Angiography demonstrated a Pial Arteriovenous Fistula (PAVF) nourished by branches of the right posterior inferior cerebellar artery, draining through an ectatic bulbar vein that further drained into perimedullary veins and the paravertebral venous plexus. The patient underwent embolization with complete occlusion of the shunt.

**Methods:** Case report of a patient hospitalized in a referral center in the metropolitan region of Curitiba in 2022 and a literature review.

**Results:** Intracranial arteriovenous fistulas (AVFs) are abnormal connections between arteries and veins that lack the nidus seen in arteriovenous malformations (AVMs). They may be associated with remote aneurysms or multiple fistulas and can be located near or within the walls of the dural venous sinuses (Dural AVFs) or within the brain parenchyma, known as Pial AVFs. PAVFs represent 1.6% of all AVMs and are mostly congenital with a high-flow pattern, allowing the development of venous ectasia. There is a male predominance (60%), and they can affect individuals from children to the elderly, with 70% occurring in individuals younger than 30 years. Intracranial hemorrhage is the main clinical presentation in adults. Treatment options for PAVFs include surgical excision, surgical clipping, endovascular occlusion of the feeding arteries, and hybrid treatments.

**Conclusions:** Intracranial PAVFs are rare cerebrovascular lesions with an unfavorable natural course. Conservative management has been associated with high mortality rates. Early diagnosis and treatment are crucial due to the associated high morbidity and mortality.

## Global Neurosurgery

ePoster presentation

### Assessment of global neurosurgery education strategies: lessons from the 1st barrow global Latin America neurosurgical course

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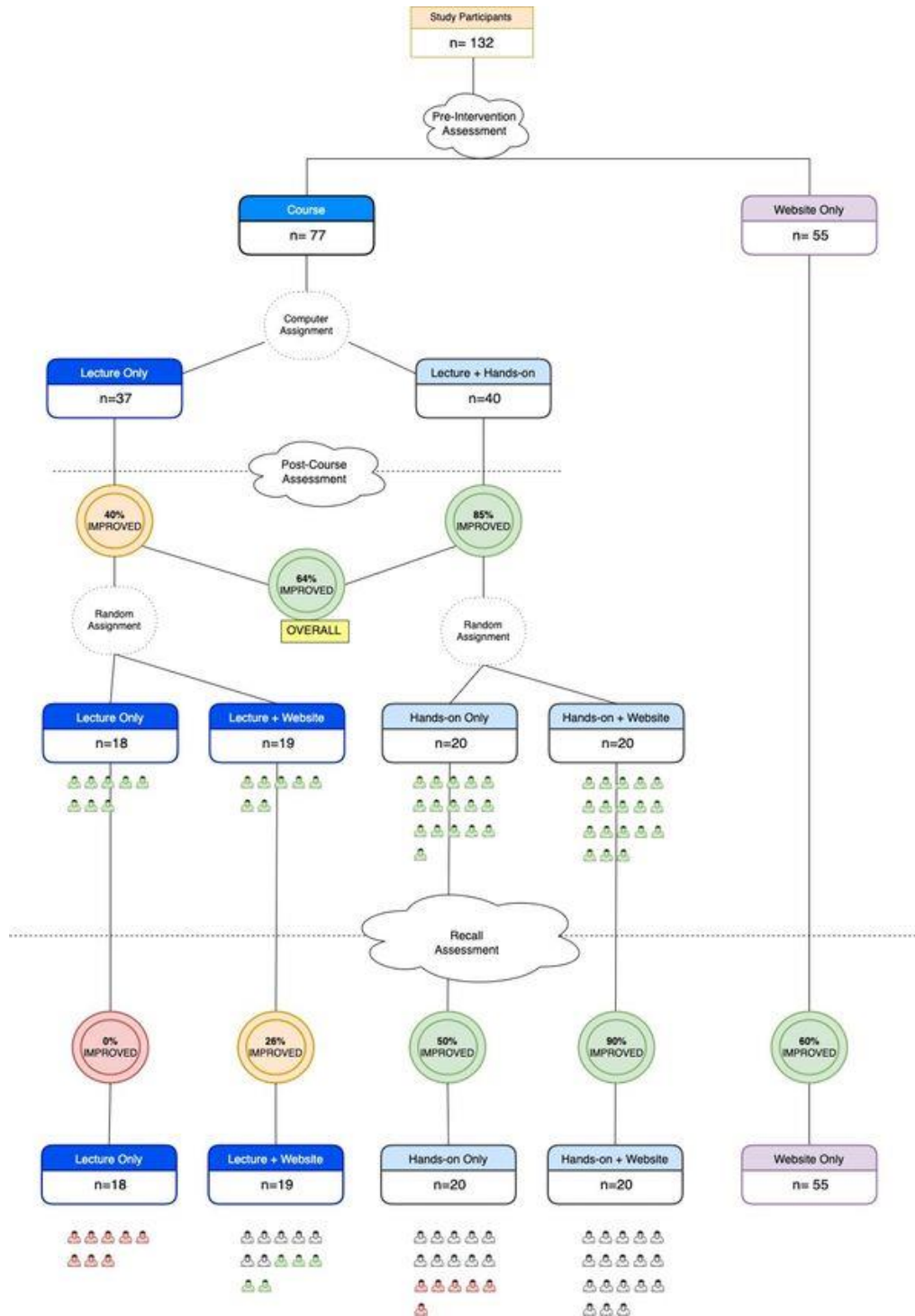
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**Objectives:** To assess the impact of global neurosurgery education strategies in Andean Latin American neurosurgical trainees.

**Background:** Operative excellence depends on both intentional neurosurgical training and exposure to a diverse volume of pathologies and techniques. Neurosurgical training in Andean Latin America is largely unregulated and organized neurosurgery does not monitor case logs. In addition, most training centers cannot afford surgical simulation events. The effectiveness of different educational strategies in improving academic excellence has not been studied before in this cultural and geopolitical environment.

**Methods:** A total of 132 neurosurgical trainees (up to 5 years of practice) from Andean Latin America participated to a 2-day neurosurgical anatomy course (supratentorial and infratentorial). A subset of 77 participants attended the course in person (n=37 Lectures only; n=40 Lectures and Hands-On). Access to a website with neurosurgical anatomy videolectures in Spanish was provided to a subgroup of each cohort. A neurosurgical assessment and professional survey was obtained before and after (both immediate and at 6 months) the course. Assessment scores were classified into tiers of excellence (subpar, basic, advanced, connoisseur).

**Results:** Participants that had access to Hands-On practice experience a significantly higher improvement of their tier of excellence (85% improved) compared to those who only attended lectures (40% improved), or website access only (60% improved)  $p < 0.01$ . All participants in the Hands-On group achieved a basic tier of excellence, irrespective of their training program (Capital vs Urban),  $p = 0.06$ . A fifth of all hands-on participants scored advanced level, which was significant improvement from baseline  $p = 0.04$ . Trainees from capital programs scored higher on infratentorial assessment than their urban counterparts,  $p < 0.01$ . Best long-term (3 month) educational improvement was observed in those with access to both hands-on and website (90% improved Fig1).



**Conclusions:** Lasting global neurosurgery educational efforts should include onsite hands-on and web-based, self-study strategies.

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## Neurovascular Surgery

Oral presentation

The relationship between cytokines in the cerebrospinal fluid and plasma, and their association with neurological outcomes in subarachnoid haemorrhage patients

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**Objectives:** This study aimed to investigate the patterns of cerebrospinal fluid (CSF) and plasma cytokine changes in SAH patients, the relationship between CSF and plasma compartments, and their association with outcomes.

**Background:** Neuroinflammation may play a crucial role in outcomes following subarachnoid haemorrhage (SAH). However, human data is limited to small series and selective reporting of multiple analyses.

**Methods:** Ten cytokine levels were measured in CSF and plasma samples from 105 SAH patients enrolled in a multicentre prospective randomised controlled trial. Patients had samples taken on day 7 post-SAH, with serial CSF samples taken in 36 patients. These were compared to 18 control patients. Regression analyses, principal component analysis (PCA), and pathway analysis were performed.

**Results:** Median CSF levels of all cytokines were higher in SAH patients compared to controls ( $p < 0.0001$ ). IL-10, IL-4, IL-6, and IL-8 plasma levels were also elevated in SAH patients ( $p < 0.05$ ). In SAH patients, CSF levels were greater than plasma levels for all cytokines ( $p < 0.001$ ). There was no correlation between individual cytokine levels in the plasma and CSF. Although multiple cytokines correlated with short-term outcomes on univariate analyses, only plasma IL-6 correlated with short-term and long-term outcomes on multivariable analyses accounting for WFNS and CT blood volume. PCA identified seven principal components among CSF and plasma cytokines. Only one principal component related to plasma cytokines was associated with increased odds of poorer outcomes on the modified Rankin Scale ( $p < 0.05$ ). Pathway analysis suggested the effects of WFNS and CT blood volume on outcomes were not mediated by this principal component.

**Conclusions:** SAH provokes a strong inflammatory response in both CSF and plasma. CSF and plasma levels are poorly correlated and not related to blood-brain barrier integrity, suggesting distinct roles in SAH pathophysiology, with plasma IL6 most tightly correlated with outcomes and the best target for future intervention.

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## Trauma

Oral presentation

### Dexamethasone versus surgery for chronic subdural hematoma

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**Objectives:** RCT comparing Surgery with Dexemathason for Chronic Subdural Hematoma.

**Background:** The role of glucocorticoids without surgical evacuation in the treatment of chronic subdural hematoma is unclear.

**Methods:** In this multicenter, open-label, controlled, noninferiority trial, we randomly assigned symptomatic patients with chronic subdural hematoma to dexamethasone or burr-hole drainage. The primary end point was functional outcome at 3 months after randomization, as assessed by the modified Rankin scale (range, 0 [no symptoms] to 6 [death]). Non-inferiority was defined by a lower limit of the 95% confidence interval of the odds ratio for a better functional outcome with dexamethasone than with surgery of 0.9 or more. Secondary end points included scores on the Markwalder Grading Scale of symptom severity and on the Extended Glasgow Outcome Scale.

**Results:** From 2016 to 2021, we enrolled 252 patients of a planned sample size of 420; 127 were assigned to the dexamethasone group and 125 to the surgery group. The mean age of the patients was 74 years, and 77% were men. The trial was terminated early by the data and safety monitoring board owing to safety and outcome concerns in the dexamethasone group. The adjusted common odds ratio for a lower (better) score on the modified Rankin scale at 3 months with dexamethasone than with surgery was 0.55 (95% confidence interval, 0.34 to 0.90), which failed to show noninferiority of dexamethasone. The scores on the Markwalder Grading Scale and Extended Glasgow Outcome Scale were generally supportive of the results of the primary analysis. Complications occurred in 59% of the patients in the dexamethasone group and 32% of those in the surgery group, and additional surgery was performed in 55% and 6%, respectively.

**Conclusions:** Dexamethasone treatment was inferior to burr-hole drainage in patients with chronic subdural hematoma and had more complications and a greater likelihood of later surgery.

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## Trauma

Oral presentation

### Comparative effectiveness of decompressive craniectomy versus craniotomy for traumatic acute subdural hematoma: a CENTER-TBI study

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**Objectives:** Analysis of centre treatment preference of decompressive craniectomy within Center-TBI.

**Background:** Limited evidence existed on effectiveness of decompressive craniectomy (DC) versus craniotomy for traumatic acute subdural hematoma (ASDH) until the recently published randomised clinical trial RESCUE-ASDH. Determine current practice patterns and compare outcomes of primary DC versus craniotomy.

**Methods:** We enrolled patients with t-ASDH who underwent acute neurosurgery throughout Europe and Israel (2014-2020). Patients with severe pre-existing neurological disorders were excluded.

In an instrumental variable analysis, we compared DC versus craniotomy for ASDH evacuation with as primary outcome the Glasgow Outcome Scale-Extended (GOSE) at 6 months. Analyses included random-effects ordinal regression with adjusted centre probability of DC as instrumental variable.

**Results:** Of 336 included patients, 91 (27%) underwent DC and 245 (63%) craniotomy for ASDH evacuation. The proportion primary DC within acute surgery cases ranged from 6-67% with an interquartile range (IQR) of 12-26% among 46 centres; odds of receiving a DC for prognostically similar patients in one centre versus another randomly selected centre were trebled (adjusted median odds ratio 2.7,  $p < 0.0001$ ). Higher centre preference for DC over craniotomy was not associated with better functional outcome (adjusted common odds ratio (OR) per 14% [IQR increase] more DC in a centre = 0.9 [95% CI 0.7-1.1],  $n = 200$ ). Primary DC was associated with more follow-on surgeries and complications [secondary cranial surgery 27% vs. 18%; shunts 11 vs. 5%]; and similar odds of in-hospital mortality (adjusted OR per 14% IQR more primary DC 1.3 [95% CI (1.0 – 3.5),  $n = 200$ ].

**Conclusions:** We found substantial practice variation in the employment of DC over craniotomy for ASDH. This variation in strategy didn't result in different functional outcomes.

Primary DC should be restricted to salvageable patients in whom immediate replacement of the bone flap is not possible.

## Spine

Oral presentation

### Decompression alone versus decompression and instrumented fusion for the treatment of isthmic spondylolisthesis: a randomized controlled trial

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**Objectives:** In this study we compared the clinical outcomes of decompression only with those of decompression with instrumented fusion in patients with isthmic spondylolisthesis.

**Background:** The most advocated surgical technique to treat symptoms of isthmic spondylolisthesis is decompression with instrumented fusion. A less-invasive classical approach has also been reported, which consists of decompression only.

**Methods:** Eighty-four patients with lumbar radiculopathy or neurogenic claudication secondary to low-grade isthmic spondylolisthesis were randomly assigned to decompression only (n = 43) or decompression with instrumented fusion (n = 41). Primary outcome parameters were scores on the Roland Disability Questionnaire (RDQ), separate visual analog scales (VASs) for back pain and leg pain, and patient report of perceived recovery at 12-week and 2-year follow-ups. The proportion of reoperations was scored as a secondary outcome measure. Repeated measures ANOVA according to the intention-to-treat principle was performed.

**Results:** Decompression alone didn't show superiority in terms of disability scores at 12-week follow-up (p = 0.32, 95% CI -4.02 to 1.34), nor in any other outcome measure. At 2-year follow-up, RDQ disability scores improved more in the fusion group (10.3, 95% CI 3.9-8.2, vs 6.0, 95% CI 8.2-12.4; p = 0.006, 95% CI -7.3 to -1.3). Likewise, back pain decreased more in the fusion group (difference: -18.3 mm, CI -32.1 to -4.4, p = 0.01) on a 100-mm VAS scale, and a higher proportion of patients perceived recovery as showing "good results" (44% vs 74%, p = 0.01). Cumulative probabilities for reoperation were 47% in the decompression and 13% in the fusion group (p < 0.001) at the 2-year follow-up.

**Conclusions:** In lumbar isthmic spondylolisthesis, surgical decompression with fusion resulted in comparable short-term results, significantly better long-term outcomes, and fewer reoperations than decompression alone. Fusion is a superior surgical technique that should be offered as first treatment option for isthmic spondylolisthesis.

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## Education, Ethics, Socioeconomic

Oral presentation

Informed consent procedures for emergency interventional research in patients with hemorrhagic stroke, aneurysmal subarachnoid hemorrhage and traumatic brain injury

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**Objectives:** Based on our earlier Lancet Neurology paper we aim to write a Capetown WFNS position paper creating a legal framework for neurosurgical interventions studies in patients with impaired consciousness. For obvious reasons prospective studies, in particular randomized controlled trials investigating neurosurgical interventions for traumatic brain injury and neurovascular disease in the acute phase are difficult and sometimes impossible to perform because our patients cannot give informed consent.

**Background:** Health-care professionals and researchers have a legal and ethical responsibility to inform patients before carrying out diagnostic tests or treatment interventions as part of a clinical study. As a result of coma, impaired consciousness or cognitive dysfunction in patients neurosurgical interventions are difficult to be randomly allocated due to absent family members in the acute phase after ER admission.

**Methods:** Interventional research in emergency situations can involve patients with some degree of acute cognitive impairment, as is regularly the case in traumatic brain injury, ischaemic- or hemorrhagic stroke. These patients or their proxies are often unable to provide informed consent within narrow therapeutic time windows. International literature has been reviewed by the authors and discussed with a view on possible solutions within a legal framework.

**Results:** In worldwide literature International regulations and national laws are criticized for being inconclusive or restrictive in providing solutions. Accepted consent alternatives are deferred consent, exception from consent, or waiver of consent. However, these alternatives appear under-utilised despite being ethically permissible, socially acceptable, and regulatorily compliant.

**Conclusions:** We anticipate that, when the requirements for medical urgency are properly balanced with legal and ethical conduct, the increased use of these alternatives has the potential to improve the efficiency and quality of future emergency interventional studies in patients with an inability to provide informed consent. During the presentation discussion within the audience, including our international members will lead to a future WFNS position paper.



1431

## Trauma

ePoster presentation

### Pattern of gunshot wound to the head in Northern Nigeria: a single center 5 year retrospective study

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**Objectives:** To retrospectively review GSWH in ABUTH, Zaria, Nigeria.

**Background:** The incidence of Gunshot Wound to the head (GSWH) in healthcare facilities is generally low compared to gunshot wounds in other body regions.<sup>1</sup> we reviewed all the patients that had GSWH who presented to ABUTH in the last 5 years.

**Methods:** Records of all the patients that had GSWH who presented to the emergency department of ABUTH from May, 2018 to May, 2023 were retrieved and relevant information extracted.

**Results:** Sixteen patients had GSWH within the study period. The records of 3 patients could not be assessed and the remaining 13 were analyzed. Eleven (76.9%) sustained their injuries from civilian firearms while 2 (15.4%) were from Military/Para-Military. Nine (69.2%) were from unknown gunmen attacking the victims in their villages, one (7.7%) was due to an armed robber's attack and the other (7.7%) was an accidental trigger from a local vigilante officer. The timing of presentation ranged from 4 hours to 2 days after injury. The majority of the patients were males, with a Male: Female ratio of 12:1. Age at presentation was 13 to 42 years old. Severity of injury was between moderate and severe. Eleven patients (84.6%) had brain CT scan done. Ten patients (76.9%) had wound debridement and duroplasty while the rest had local wound care. Five patients (38.5%) presented with retained missile bullets. All the objects extracted at debridement were improvised missiles (4 were motorcycle ball bearings, and 1 was a broken bolt knot). Two patients (15.4 %) died, 7 (58.8%) developed surgical site infection, and 1 had complete visual loss due to bilateral damage of the optic nerves by the bullet trajectory.

**Conclusions:** GSWH is a significant cause of morbidity and mortality, predominantly affecting young men in a civilian setting. In our environment, use of improvised materials as bullet is common.

1432

## Functional

Oral presentation

Deep brain stimulation of anteromedial subthalamic nucleus for obsessive-compulsive disorder: preliminary results from an open-label study

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**Objectives:** Study of Outcomes of DBS in OCD.

**Background:** Despite the evidence for its efficacy in treatment-refractory obsessive-compulsive disorder (OCD), there is limited use of deep brain stimulation (DBS), especially in developing countries. We present preliminary data from an open-label study on DBS for OCD in India.

**Methods:** Five patients with severe and chronic treatment-refractory OCD underwent DBS of anteromedial subthalamic nucleus (amSTN). They were assessed with standardized questionnaires including Yale- Brown Obsessive-Compulsive Scale (Y-BOCS) scores, Hamilton scales for anxiety (HAM-A) and depression (HAM-D) with follow-up periods ranging from 1-15 months. The position of the active electrode contacts was evaluated by fusing pre-operative and postoperative scans using an open-source neuroimaging tool (LEAD-DBS).

**Results:** While all patients met the criteria for partial response ( $\geq 25\%$  reduction in Y-BOCS), 4 of the 5 patients met the criteria for response ( $\geq 35\%$  reduction in Y-BOCS) at some point during the follow-up. The severity of OCD symptoms fluctuated in two patients following the modification of stimulation parameters due to dyskinesia. Active contacts in the limbic/associative regions of STN was associated with improved OCD symptoms. Changes in anxiety and depressive symptoms mirrored changes in OCD symptoms. Adverse effects such as dyskinesia, dysphoria and hypomania improved after optimising stimulation parameters.

**Conclusions:** DBS of amSTN is helpful in decreasing OCD and concomitant anxiety/mood symptoms in patients with treatment-refractory OCD. Stimulation of contacts in the limbic/associative STN may foster clinical outcomes.

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## Spine

Oral presentation

Chordoma: a systematic review of the epidemiology and clinical prognostic factors predicting progression-free and overall survival

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**Objectives:** The aim of this systematic review is to describe the epidemiology of chordoma and to provide a clear overview of clinical prognostic factors predicting progression-free and overall survival.

**Background:** Chordoma of the mobile spine, sacrum and skull-base is a complex disease which needs multidisciplinary diagnostic and treatment approaches. Treatment strategies with surgery without or with (neo)adjuvant proton beam therapy pose treating physicians with difficult problems. The "first-strike" strategy, historically proposed by professor Alan Crockard, with (cranio)spinal is not always feasible. Future patients need an intervention-prognostic model.

**Methods:** Four databases of medical literature were searched. Separate searches were performed for each of the two objectives. Reference and citation tracking was performed. Papers were processed by two independent reviewers according to a protocol that included risk of bias analysis. Disagreement was resolved by discussion. Pooled analyses were planned if homogeneity of data would allow.

**Results:** Incidence rates ranged between 0.18 and 0.84 per million persons per year and varied between countries and presumably between races. On average patients were diagnosed in their late fifties and gender data indicate clear male predominance. Two of the largest studies (n = 400 and n = 544) reported different anatomical distributions: one reporting the skull base and sacrococcygeal area affected in 32% and 29% of cases, whereas the other reporting that they were affected in 26% and 45% of cases, respectively.

Statistically significant adverse prognostic factors predicting progression-free and overall survival include female sex, older age, bigger tumour size, increasing extent of tumour invasion, non-total resection, presence of metastasis, local recurrence, and dedifferentiated histological subtype.

**Conclusions:** Incidence rate and anatomical distribution vary between countries and presumably between races. Most chordomas arise in the skull base and sacrococcygeal spine, and the tumour shows clear male predominance. Multiple adverse prognostic factors predicting progression-free and overall survival were identified in subgroups of patients.

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## Spine

Oral presentation

Surgical versus non-surgical treatment for sciatica: systematic review and meta-analysis of randomised controlled trials (*BMJ* 2023)

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**Objectives:** To investigate the effectiveness and safety of surgery compared with non-surgical treatment for sciatica.

**Background:** The optimal timing of disc surgery for sciatica was unknown until 2 decades ago, due to lacking evidence. Since then several RCT's have been performed comparing any surgical treatment with non-surgical treatment, epidural steroid injections, or placebo or sham surgery.

**Methods:** Systematic review and meta-analysis through by 2 independent reviewers extracting data from Embase, CINAHL, Cochrane Central Register of Controlled Trials, ClinicalTrials.gov, and World Health Organisation International Clinical Trials Registry Platform from database inception to June 2022. Leg pain and disability were the primary outcomes.

**Results:** A total 24 trials were included, half of these investigated effectiveness of discectomy compared with non-surgical treatment or epidural steroid injections (1711 participants). Very low to low certainty evidence showed that discectomy, compared with non-surgical treatment, reduced leg pain: the effect size was moderate at immediate term (mean difference -12.1 (95% confidence interval -23.6 to -0.5)) and short term (-11.7 (-18.6 to -4.7)), and small at medium term (-6.5 (-11.0 to -2.1)). Negligible effects were noted at long term (-2.3 (-4.5 to -0.2)). For disability, small, negligible, or no effects were found. A similar effect on leg pain was found when comparing discectomy with epidural steroid injections. For disability, a moderate effect was found at short term, but no effect was observed at medium and long term. The risk of any adverse events was similar between discectomy and non-surgical treatment (risk ratio 1.34 (95% confidence interval 0.91-1.98)).

**Conclusions:** Evidence suggests that discectomy was superior to non-surgical treatment in reducing leg pain and disability in people with sciatica with a surgical indication, but the benefits declined over time. Early discectomy might be an option for people with sciatica who feel that the rapid relief offered by discectomy outweighs the risks and costs associated with surgery.

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## Trauma

Oral presentation

Mortality reduction of surgery in t-ASH since the 19th century: systematic review with dramatic effect: Is surgery the obvious parachute?

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**Objectives:** The aim of this study is to determine whether surgery reduces mortality in traumatic ASDH compared with initial conservative treatment.

**Background:** The rationale of performing surgery for acute subdural hematoma (ASDH) to reduce mortality is often compared with the self-evident effectiveness of a parachute when skydiving. Nevertheless, it is of clinical relevance to estimate the magnitude of the effectiveness of surgery.

**Methods:** A systematic search was performed in the databases IndexCAT, PubMed, Embase, Web of Science, Cochrane library, CENTRAL, Academic Search Premier, Google Scholar, ScienceDirect, and CINAHL for studies investigating ASDH treated conservatively and surgically, without restriction to publication date, describing the mortality. Cohort studies or trials with at least five patients with ASDH, clearly describing surgical, conservative treatment, or both, with mortality at discharge, reported in English or Dutch, were eligible.

**Results:** The search yielded 2025 reports of which 282 were considered for full-text review. After risk of bias assessment, we included 102 studies comprising 12,287 patients. The data were synthesized using meta-analysis of absolute risks; this was conducted in random-effects models, with dramatic effect estimation in subgroups. Overall mortality in surgically treated ASDH is 48% (95% confidence interval [CI] 44-53%). Mortality after surgery for comatose patients (Glasgow Coma Scale  $\leq 8$ ) is 41% (95% CI 31-51%) in contemporary series (after 2000). Mortality after surgery for non-comatose ASDH is 12% (95% CI 4-23%). Conservative treatment is associated with an overall mortality of 35% (95% CI 22-48%) and 81% (95% CI 56-98%) when restricting to comatose patients. The absolute risk reduction is 40% (95% CI 35-45%), with a number needed to treat of 2.5 (95% CI 2.2-2.9) to prevent one death in comatose ASDH.

**Conclusions:** Surgery is effective to reduce mortality among comatose patients with t-ASDH. The magnitude of the effect is large, although the effect size may not be sufficient to overcome any bias.

1437

## Global Neurosurgery

Oral presentation

A systematic review and meta-analysis on the surgical versus endovascular treatment for ruptured intracranial aneurysms from a geographical perspective

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**Objectives:** The objective of this systematic review and meta-analysis(SRM) was to study the 1-year outcomes of mortality, functional dependency, rebleeding, vasospasm, hydrocephalus and seizures following surgical versus endovascular treatment of ruptured intracranial aneurysm(RIA) across high-income countries(HICs) and low- and middle-income countries(LMICs) to guide policies seeking to promote global surgical equity.

**Background:** Surgical and endovascular therapy of ruptured brain aneurysms are recognized forms of treatment worldwide. It remains questionable whether the respective result is influenced not only by patient factors but also by economic-geographical circumstances.

**Methods:** An SRM comparing the outcomes of surgical and endovascular approaches without limitation to language and publication dates was performed and analysed using a multivariate logistic regression in RevMan 5.4.1 with a 95% confidence interval.

**Results:** Globally with 97,202 patients from 112 selected articles, 9,532 deaths (13.1%) were recorded with lower 1-year mortality in the surgical cohort (12.8% vs 13.5%, I<sup>2</sup> 88%, P <0.00001). However, mortality was not significantly increased in HICs cohort (13.3% vs. 12.7%, I<sup>2</sup> 89%, P <0.00001) after surgical procedure, contrary to the significantly greater post-surgical risk in LMICs (20.3% vs. 13.9%, I<sup>2</sup> 0%, P=0.001). Permanent disability, rebleeding, vasospasm and hydrocephalus' reduced incidences were influenced by endovascular treatment globally. Surgery poses a greater risk

of post-operative seizures irrespective of a patient's geographical location.

**Table 1: Meta-analysis Results**

Outcomes		Overall effect			Heterogeneity	
		Effect estimate	95% CI	p-Value	I <sup>2</sup> (%)	p-Value
HICs	Mortality	0.99	0.94 - 1.04	<0.05	90	< 0.00001
	mRS 3-5	1.08	1.00 - 1.16	<0.05	51	<0.00001
	Rebleeding	1.32	1.03 - 1.68	<0.05	78	< 0.00001
	Vasospasm	1.59	1.41 - 1.78	<0.05	87	<0.00001
	Hydrocephalus	1.35	1.28 - 1.42	<0.05	92	< 0.00001
	Seizures	1.11	0.99 - 1.24	<0.05	84	<0.00001
LMICs	Mortality	1.57	1.20 - 2.06	<0.05	0	0.95
	mRS 3-5	1.57	1.30 - 1.88	<0.05	22	0.20
	Rebleeding	0.46	0.26 - 0.80	<0.05	34	0.12
	Vasospasm	0.80	0.60 - 1.06	<0.05	66	0.0007
	Hydrocephalus	0.43	0.30 - 0.60	<0.05	90	< 0.00001
	Seizures	2.28	1.33 - 2.92	<0.05	0	0.58
Global Picture	Mortality	1.01	0.96 - 1.05	<0.05	88	< 0.00001
	mRS 3-5	1.13	1.06 - 1.21	<0.05	52	<0.00001
	Rebleeding	1.11	0.89 - 1.39	<0.05	74	< 0.00001
	Vasospasm	1.44	1.29 - 1.60	<0.05	86	<0.00001
	Hydrocephalus	1.31	1.25 - 1.39	<0.05	92	< 0.00001
	Seizures	1.14	1.02 - 1.28	<0.05	78	<0.00001
HICs & LMICs Differences	Mortality				90.9	0.0009
	mRS 3-5				93.4	0.0002
	Rebleeding				91.2	0.0007
	Vasospasm				94.7	<0.0001
	Hydrocephalus				97.6	<0.00001
	Seizures				84.7	0.01

**Conclusions:** Although neurosurgical treatment reduces the risk of mortality irrespective of a country's HDI, its effect on the post-surgical mortality in HICs was not significantly different from the endovascular cohort. Endovascular therapy was significantly associated with lower mortality in LMICs. Endovascular therapy had a significantly lower risk of permanent disability and seizures in both LMICs and HICs. Endovascular repair also improved rebleeding, hydrocephalus and vasospasm risks in HICs but had no significant influence on these outcomes in LMICs.

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## Trauma

ePoster presentation

### Correlation between the profile of intracranial hemorrhages resulting from traumatic brain injury and the Glasgow Outcome Scale (GOS) at discharge

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**Objectives:** To establish a relationship between patient profiles, patterns of intracranial hemorrhage resulting from TBI, and the outcomes measured by GOS.

**Background:** TBI can cause hemorrhages, which exhibit different clinical patterns and imaging findings, typically associated with a worse prognosis. The GOS is an important tool for measuring the functional capacity of post-TBI patients.

**Methods:** Retrospective cohort study. Included individuals above 18 years of age, who presented intracranial hemorrhage resulting from TBI in the admission CT. The collected data were: gender; age; comorbidities; mechanism of trauma; GCS at the scene; presence of cranial fracture; presence, location, and extent of subdural, epidural, subarachnoid, and intraparenchymal hemorrhages; and number of affected lobes. At discharge, the association of these characteristics with 4 out of 5 GOS classifications was evaluated: death; severe disability; moderate disability; and mild disability/good recovery.

**Results:** A total of 193 patients were included, with an average age of 49±20 years, predominantly male (78.8%). The majority (74.1%) were discharged with mild disability/good recovery, 6.2% with moderate disability, 5.2% with severe disability, 0.5% in a vegetative state, and 14% died. There was a significant association between having one injury and mild disability (residual: 4.1), two injuries and moderate disability (residual: 2.4), three injuries and severe disability (residual: 2.9), and four or more injuries and death (residual: 4.5). A direct significant association was observed between mild TBI and mild disability (residual: 6.6), and between severe TBI and severe disability and death (residuals: 4.0 and 5.9, respectively). The outcome of death was associated with the presence of cranial fracture ( $p=0.022$  and residual: 2.6), temporal lobe injury ( $p=0.014$  and residual: 2.5), tentorial subarachnoid hemorrhage ( $p=0.012$  and residual: 2.8), and injuries in other locations ( $p=0.022$  and residual: 3.0).

**Conclusions:** It was found that the more severe the TBI and the greater the number of cranial injuries, the worse the patient outcomes.



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## Trauma

ePoster presentation

### A Prognostic study: comparison of Optic Nerve Sheath Diameter to Eyeball Transverse Diameter ratio (ONSD/ETD) in CT Rotterdam and GOS

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**Objectives:** To measure the ONSD (optic nerve sheath diameter), ETD (Eyeball transverse diameter) and their ratio among patients with traumatic brain injury (TBI). To compare ONSD/ETD ratio between pre and post operative TBI patients. To find the clinical and prognostic significance in TBI patients by correlating the above parameters with Rotterdam CT severity score and Glasgow outcome scale.

**Background:** Elevated intracranial pressure (ICP) necessitates accurate monitoring. Non-invasive methods, including optic nerve and global transverse diameter measurements, show promise. Scoring systems like CT Rotterdam and GOS coma scale assess brain injury severity and prognosis. This study aims to correlate optic nerve diameter, global transverse diameter, CT Rotterdam score, GOS coma scale, and patient outcomes for enhanced assessment of elevated ICP.

**Methods:** We conducted a retrospective study of head injury patients who underwent craniotomy. We measured the optic nerve diameter, global transverse diameter, and ratio of pre- and post-operative values. We also recorded the GOS and CT Rotterdam score for each patient. Pearson's correlation coefficient was used to investigate the correlation between the optic nerve diameter, global transverse diameter, and the GOS and CT Rotterdam score.

**Results:** There was also a strong positive correlation between the optic nerve diameter and global transverse diameter and the CT Rotterdam score ( $r = 0.78$ ,  $p < 0.001$ ). Additionally, there was a moderate negative correlation between the optic nerve diameter and global transverse diameter and the GOS score ( $r = -0.53$ ,  $p = 0.001$ ).

**Conclusions:** The comparison of ONSD/ETD ratios in pre and post-operative TBI patients showed a significant reduction in the ratio following surgical intervention, indicating a decrease in elevated ICP. The preoperative ONSD/ETD ratio demonstrated a positive correlation with Rotterdam CT scoring, suggesting its potential as a marker of intracranial pathology. However, its utility in predicting functional outcome as measured by GOS was not significant.

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## Education, Ethics, Socioeconomic

Oral presentation

Preoperative neurosurgical planning using free mobile application

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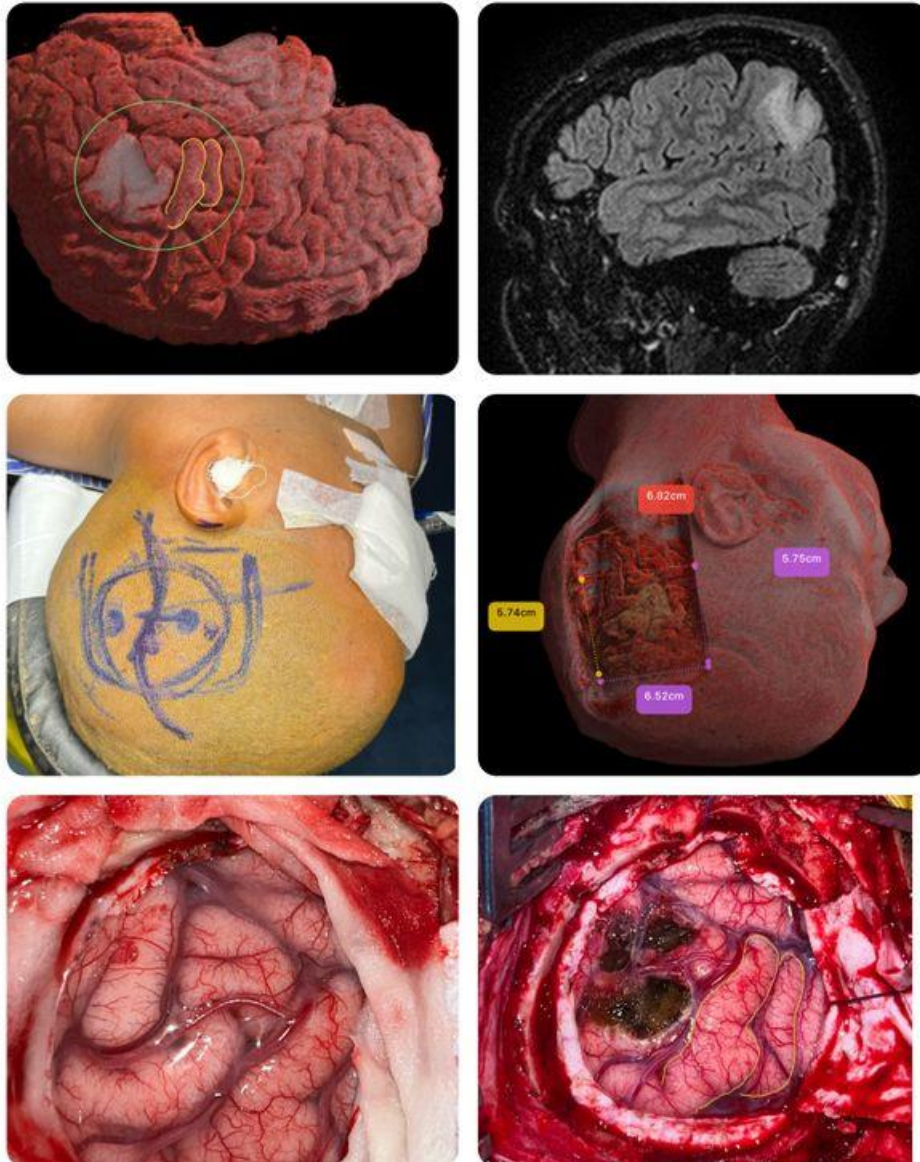
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**Objectives:** 1. Aim of the present study is to present a method of virtual planning to enhance 3D comprehension of neurosurgical pathologies using free mobile software.

2. Comparison of mobile 3D planning accuracy with neuronavigation system.

**Background:** Correct preoperative planning is the prerequisite for successful outcome and requires years of training. Modern day technologies including neuronavigation system and simulation station provide important aid in this regard. However these system require expensive software and dedicated workstation. To address this difficulty we describe a cheap alternative for neurosurgical planning using a free mobile software.

**Methods:** This study included 40 patients who underwent surgery from December 2022 to June 2023 at a single institution. All patients underwent standard CT/MRI before surgery. Using the free mobile software we describe the technique to create 3D reconstruction of head-utilising the DICOM images. This reconstructed image shows sulcogyral, arteriovenous and deep structures anatomy and its relation to the lesion. Using various tools in the application its possible to create coloured images of the lesion and plan incision, craniotomy and surgical trajectory with virtual 3D image. Accuracy of preoperative planning using mobile based 3D images of the surgical pathology were compared with the intraoperative findings and neuronavigation system.



**Results:**

Case Example.

40 patients were included in the study. We have used this software in 30 brain & 10 spine cases including brain tumours, AVM, aneurysms and complex CV junction anomalies. Lesion was accurately localised and its relation with nearby cortical and vascular structures were well demonstrated by 3D images in all patients.

**Conclusions:** This technique of 3D reconstruction using mobile software has not been described previously in our field due to unawareness of their existence. 3D interpretation of cranial structures along with digital manipulation can aid in developing an effective surgical approach in resource limited centres.

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## Skull Base

Oral presentation

Giant Olfactory Groove Meningiomas: a case series demonstrating the surgical management and functional outcomes

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**Objectives:** This study provides a comprehensive analysis of the surgical approaches and their outcomes encountered in the surgical management of Giant olfactory groove meningiomas (OGMs) at a single institution.

**Background:** OGMs present technical challenges in their management, especially when their size and location complicate the evaluation and planning process, making complete removal difficult. Various strategies have been employed for their management and the outcome varies accordingly.

**Methods:** This retrospective study was to evaluate surgical and functional outcomes. 71 patients were diagnosed with giant OGMs larger than 6 cm that were excised using microsurgical resection via the bifrontal, pterional, or combined pterional and unifrontal approaches.

**Results:** The study comprised 41 females (67.6%) and 23 males (32.4%), with a mean age of 54.1 years. The most common pathological type was meningothelial meningioma (45%). The bifrontal approach was the most frequently used (n = 47, 66.2%) and resulted in Simpson grade I-II resection in 41 patients (87.2%). The combined pterional and unifrontal approaches were used in 16 patients (22.5%), and Simpson grade I-II resection was achieved in 12 (75%). The pterional approach was the least commonly used (n = 8), and Simpson grade I-II resection was achieved in 50% of these patients. Postoperatively, visual acuity and cognitive function improved during follow-up. Postoperative complications were frequently observed after the bifrontal approach. In our study, three patients (4.2%) died.

**Conclusions:** We concluded that the bifrontal approach resulted in better resection of giant OGMs than other approaches; however, it was associated with more complications. The combined pterional and unifrontal approach was superior to the pterional approach in terms of OGM resection, and there were no differences in complication rates. Significant postoperative improvements in functional outcomes, including visual acuity and cognitive function, were observed.

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## Oncology

ePoster presentation

Periventricular and intraventricular tumors in a low-income country: hard learning curve and outcome of a young neurosurgeon from Burkina Faso

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**Objectives:** Share the experience in the management of periventricular and intraventricular processes in a low-income country.

Emphasize the clinicopathological features and outcomes of these processes in our experience.

**Background:** Periventricular and intraventricular processes are life-threatening conditions because of their propensity to obstruct cerebrospinal fluid pathways and to compress highly functional and vital structures. Their resection requires rigorous microsurgical technique.

**Methods:** We retrospectively analyzed the profile and outcome of periventricular and intraventricular processes operated by the same author since his return to his country in 2015, after graduating abroad in the WFNS Rabat training center program until today (2023).

**Results:** We defined 15 patients operated over 7 years. There were: 4 processes in lateral ventricle (26.6%), 1 in third ventricle (6.6%), 2 thalamus processes (13.3%), 4 in fourth ventricle (26.6%) and 4 in cerebellar hemisphere with violation of fourth ventricle (26.6%). Various surgical approaches were used, such as contralateral interhemispheric transcallosal, classical interhemispheric transcallosal, subfrontal transbasal translamina terminalis, telovelar, transcortical approaches, ventriculoperitoneal shunting and endoscopy. Surgical procedure duration was more than 10 hours in 12 cases (80%) and one third of the patients have been operated in 2018. When neurosurgical operative microscope was not available, ophthalmologic microscope or binocular were used. Pathological examination revealed high-grade glioma, SEGA, central neurocytoma, subependymoma, hemangioblastoma, pilocytic astrocytoma, medulloblastoma, gemistocytic astrocytoma, atypical papilloma of choroid plexus, craniopharyngioma and cyst of septum pellucidum. We reported good postoperative outcome in 10 cases (66.6%) and 4 cases of postoperative death (26.6%) among which 3 cases of postoperative meningitis.

**Conclusions:** Periventricular and intraventricular processes can be safely approached in a low-income country with acceptable results. However, young African neurosurgeons should be trained to be comfortable with multiple surgical approaches, also with binocular as well as microscope. WFNS training program is a strong foundation for the take-off of young African neurosurgeons. Backing home should be the rule.

1445

## Global Neurosurgery

ePoster presentation

Intracranial hematoma after ventriculoperitoneal shunt placement in a patient with Factor V Deficiency: a rare case report

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**Objectives:** Report clinical, radiological, and biological case findings, as well as management before, during, and after surgery, with a detailed postoperative follow-up.

**Background:** Congenital factor V deficiency (FVD) is a rare bleeding disorder due to an inherited mutation. So far, there are no standard protocols for pre- and peri-operative management of patients with factor V deficiency. This poses a challenge for surgeons and requires a multidisciplinary approach.

**Methods:** Case report and literature review.

**Results:** We present a case of a 60-year-old woman with factor V deficiency admitted to the neurosurgery department of Ibn Tofail Hospital for hydrocephalus requiring a ventriculoperitoneal shunt. Pre-operative management of the patients as well as outcome and follow-up are described and compared with relevant literature.

**Conclusions:** Congenital FVD is a rare severe bleeding disorder. A severe quantitative FV deficiency can lead to significant spontaneous bleeding episodes that pose a serious risk to life. Intravenous FFP is recommended in pre-operative preparation to improve the FV rate and reduce the probability of bleeding.

1446

## Spine

Oral presentation

Guided posterior vertebral modulation: a new fusionless technique for correction of adolescent idiopathic scoliosis

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**Objectives:** The aim of this study was to report the restauration of the normal vertebral morphology and the absence of curve progression after removal the instrumentation in AIS patients that underwent posterior correction by common all screws construct whitout fusion.

**Background:** Current techniques of anterior vertebral growth modulation by vertebral body stapling or tethering provide an incomplete and unpredictable correction of the deformity in addition to the disadvantages of the required thoracotomy. Recently, experimental evidence of growth modulation of the vertebral epiphyseal plates utilizing a posterior approach using pedicle screws was confirmed.

**Methods:** A series of 36 AIS immature patients (Risser 3 or less) were include in the study. Instrumentation was removed once the maturity stage was complete (Risser 5). Curve correction was assessed at pre and postoperative, before instrumentation removal, just post removal, and more than two years after instrumentation removal. Epiphyseal vertebral growth modulation was assessed by a coronal wedging ratio (WR) at the apical level of the main curve (MC).

**Results:** The mean preoperative coronal Cobb was corrected from  $53.7^\circ \pm 7.5$  to  $5.5^\circ \pm 7.5^\circ$  (89.7%) at the immediate postop. After implants removal (31.0 $\pm$ 5.8 months) the MC was 13.1°. T5–T12 kyphosis showed a significant improvement from 19.0° before curve correction to 27.1° after implants removal ( $p < 0.05$ ). Before surgery, WR was 0.71 $\pm$ 0.06, and after removal WR was 0.98 $\pm$ 0.08 ( $p < 0.001$ ). At the end of follow-up, the mean sagittal range of motion (ROM) of the T12-S1 segment was 51.2 $\pm$ 21.0°. SRS-22 scores improved from 3.31 $\pm$ 0.25 preoperatively to 3.68 $\pm$ 0.25 at final assessment ( $p < 0.001$ ).

**Conclusions:** In conclusion, fusionless posterior approach using a common all pedicle screws construct correct satisfactory scoliotic main curves and permits removal of the instrumentation once the bone maturity is reached. The final correction was highly satisfactory and an acceptable ROM of the previously lower instrumented segments was observed.



1447

## Spine

ePoster presentation

Gabapentinoids in the symptomatic management of spinal stenosis: a comparative study on pain relief, ambulation and safety profile

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**Objectives:** The objective of this study was to investigate whether the use of pregabalin and gabapentin is effective in the symptomatic management of canal stenosis.

**Background:** The multimodal management of canal stenosis increasing, and inhibitors of central sensitization are playing a crucial role in central sensitization processes. Pregabalin and gabapentin are antiepileptic drugs that reduce presynaptic excitability.

**Methods:** A literature search was conducted in four databases. The inclusion criteria were studies that compared pregabalin or gabapentin with a control group in lumbar canal stenosis. Randomized clinical trials and a comparative retrospective cohort study were included. The main clinical endpoints were VAS/NRS, ODI, and RDQ (Roland Morris Disability Questionnaire) at 2, 4, 8 weeks, and 3 months, adverse events, and walking distance were also collected. Data were combined using Review Manager 5.4 software.

**Results:** Six studies and 392 patients were included. The mean age was 60.25. No significant differences were observed in VAS at 2, 4, and 8 weeks: (MD: 0.23; 95% CI: -0.63-1.09), (MD: -0.04; 95% CI: -0.64 to -0.57), and (MD: -0.6; 95% CI: -1.22 to 0.02). Significant differences were observed in favor of pregabalin with respect to VAS at three months: (MD: -2.97; 95% CI: -3.43 to -2.51). No significant differences were observed in ODI (MD: -3.47; 95% CI: -7.15 to -0.21). Adverse events were significantly higher in the pregabalin/gabapentin group (OR 5.88, 95%CI 1.28-27.05). Walking distance and RDQ could not be compared, although the results were controversial.

**Conclusions:** Gabapentinoids have not been shown to be superior to other drugs used in the treatment of LSS or to placebo. However, they have shown a higher incidence of adverse effects, improved results in VAS at 3 months, and a slight improvement in ambulation at 4 months in combination with NSAIDs compared to NSAIDs in monotherapy.



1448

## Spine

Oral presentation

Abolition of sagittal T7–T10 dynamics during forced ventilation in AIS patients with Lenke 1A curves

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**Objectives:** The aim of this study was to analyze the dynamics of the thoracic spine during deep breathing in AIS patients and in healthy matched controls.

**Background:** In healthy subjects, respiratory maximal volumes are highly dependent on the sagittal range of motion of the T7–T10 segment. In AIS, the abolition of T7–T10 dynamics related to the stiffness induced by the apex region in Lenke IA curves could harm ventilation during maximal breathing.

**Methods:** This is a cross-sectional, case–control study. 20 AIS patients (18 girls, Cobb angle,  $54.7 \pm 7.9^\circ$ ; Risser  $1.35 \pm 1.2$ ) and 15 healthy volunteers (11 girls) matched in age (12.5 versus 15.8 years mean age) were included. In AIS curves, the apex was located at T8 (14) and T9 (6). Conventional sagittal radiographs of the whole spine were performed at maximal inspiration and exhalation. The ROM of each spinal thoracic functional segment (T1–T7, T7–T10, T10–T12) and the global T1–T12 ROM were measured.

**Results:** In healthy subjects, the mean T1–T12 ROM during forced breathing was  $16.7 \pm 3.8$ . AIS patients showed a T1–T12 ROM of  $1.1 \pm 1.5$  ( $p < 0.05$ ), indicating a sagittal stiffness of the thoracic spine. A wide T7–T10 ROM ( $15.3 \pm 3.0$ ) was found in healthy controls (91.6% of the T1–T12 ROM). AIS patients showed only  $0.4 \pm 1.4$  ROM at T7–T10 (36.4% of the T1–T12 ROM) ( $p < 0.001$ ). There was a linear relationship between the magnitude of T7–T10 kyphosis in maximal exhalation and both FVC (% of predicted FVC) and FEV1.

**Conclusions:** In conclusion, Lenke 1A AIS patients show a restriction of the thoracic spine motion with an almost complete abolition of T7–T10 ROM, a crucial segment for deep breathing. T7–T10 stiffness could explain the ventilatory limitations found in AIS patients.

1449

## Spine

Oral presentation

### Incidence of vitamin D deficiency in adolescent idiopathic scoliosis: a meta-analysis

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**Objectives:** The purpose of this study was to investigate the incidence of vitamin D deficiency in patients with adolescent idiopathic scoliosis (AIS) through a meta-analysis, as well as to analyze risk factors.

**Background:** The association between vitamin D and adolescent idiopathic scoliosis (AIS) has recently been studied. It is believed that vitamin D may play a crucial role in the etiopathogenesis of AIS, as well as serve as a biomarker in response to treatment and pain management.

**Methods:** Relevant studies were identified through searches using the terms "Vitamin D AND scoliosis". Data on incidence and risk factors such as race, curve magnitude, and gender were extracted from the selected studies. To limit the search to more recent studies, only those published between 2010 and 2023 were included. Review Manager 5.4 software was used for data analysis.

**Results:** Six studies were included, with a total of 1428 patients. The incidence of vitamin D insufficiency and deficiency in AIS patients was 36.19%, 95%CI [21.93-50.46] and 41.43%, 95%CI [16.62-66.23] respectively. Caucasian patients showing a lower risk of vitamin D deficiency [RR 0.15, 95%CI 0.03-0.82]. There was also an association between patients with AIS and lower vitamin D levels -5.58, 95%CI [-7.10 to -4.06]. Finally, no significant differences were observed regarding the magnitude of the deformity assessed by the Cobb angle DM 4.45, 95%CI [-0.55-9.44]. No differences were observed by gender with lower than normal vitamin D levels OR 0.96, 95%CI [0.58-1.60].

**Conclusions:** In conclusion, the incidence of vitamin D insufficiency in AIS patients was 36.19%, and the incidence of vitamin D deficiency was 41.43%. Caucasian race showed a lower risk of vitamin D deficiency than African race, and an association was found between AIS patients and lower vitamin D levels. Finally, no significant differences were observed regarding the magnitude of the Cobb angle or by gender.

1450

## Spine

Oral presentation

### Incidence of genitourinary anomalies in congenital scoliosis: systematic review and meta-analysis

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**Objectives:** The main objective of this study was to assess the overall incidence of genitourinary anomalies in patients with congenital scoliosis by providing the highest level of evidence. The secondary objective was to look for associations and trends influencing the incidence.

**Background:** Congenital scoliosis is a spinal disorder that affects 1/1000 patients. The incidence of genitourinary anomalies varies according to studies.

**Methods:** A meta-analysis using PubMed, Embase, Scopus, and the Cochrane Collaboration Library database was carried out. We included studies focusing on patients with congenital scoliosis and genitourinary anomalies. The main outcome was the incidence of genitourinary anomalies in congenital scoliosis. We also collected the following data: patient gender, type of deformity (formation, segmentation, or mixed), deformity location, and associated anomalies. We included cohort studies. Data was extracted from published reports and combined using Review Manager 5.4. The quality of the included studies was assessed independently by two authors using the Methodological Index for Non-Randomized Studies (MINORS) criteria.

**Results:** A total of eight studies (2781 patients) were included. The incidence of genitourinary anomalies associated with congenital scoliosis was 22.91% (95%CI 13.39%-32.43%). The incidence of surgically treated genitourinary anomalies was 13.92% (95%CI 4.54%-23.31%). There were no differences related to gender (male 49.3% versus female 50.7%;  $p > 0.05$ ). There were no differences regarding the type of deformity. The incidences of associated intraspinal, cardiac, musculoskeletal and craniofacial anomalies were 33.30%, 17.60%, 27.77% and 19.83% respectively. The most frequent genitourinary anomalies were: unilateral kidney (111/388); renal ectopia (50/367); obstructive uropathy (30/201), horseshoe kidney (30/313) and undescended testicle (16/180).

**Conclusions:** The incidence of genitourinary anomalies associated with congenital scoliosis was 22.91%, and 13.92% were surgically treated. Unilateral kidney was the most common genitourinary abnormality. There were no differences between genders and deformity types. It is important to consider the association between genitourinary anomalies and intraspinal or musculoskeletal anomalies.

1451

## Oncology

Oral presentation

### Brainstem tumour surgery: single center experience

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**Objectives:** To evaluate short-term and long-term outcomes in patients with low- and high-grade brainstem tumours depending on their location, extent of resection and preoperative patient status.

**Background:** Despite new advancements in neurosurgical technique and neuromonitoring capabilities, brainstem tumours continue to represent a significant challenge for neurosurgeons due to mostly unfavorable patient outcomes reported in the literature. Yet meticulous preoperative planning, use of modern neuromonitoring and neurosurgical techniques enables adequate tumour resection with favorable short- and long-term outcomes.

**Methods:** A retrospective data analysis of 66 consecutive patients with brainstem lesions was performed. Tumour location was evaluated according to the classification proposed by M.Choux et al. Extent of resection analyzed according to early (no later than 48 hours after surgery) MRI data. Short-term neurological examination performed and Karnofsky performance score (KPS) evaluated in all patients. As for long-term outcome, overall survival (OS) was analyzed in all patients with high-grade gliomas (HGG) and Karnofsky scale on last visit in all low-grade glioma (LGG) patients.

**Results:** According to data attained in our series, brainstem tumours are more common in children, with no gender predominance. Mean age was 21.4 years (range 2-77). The most common tumour type was focal, with pontine location being the most common. Telovelar approach was the most common executed for pons and medulla oblongata tumours, while transcortical transventricular endoscopic procedure was the most common for patients with midbrain lesions (executed to perform endoscopic third ventriculostomy). In our series low-grade tumour were predominant, with gross total resection achieved in 17 out of 36 patients (47.2%). The neurological status of 71% of patient improved or stayed the same in the postoperative period, while 73.2% of patients with LGGs had a KPS of 80 to 100.

**Conclusions:** Brainstem surgery is becoming safer with use of modern techniques. Patient with focal LGGs may significantly benefit from surgery.

1452

## Paediatric

ePoster presentation

Two different presentations of diffuse intrinsic pontine glioma (DIPG) in a paediatric neurosurgical unit

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**Objectives:** 1. To describe two cases of DIPG in a five-year old girl and a 3-year-old in a paediatric neurosurgical unit in Chris Hani Baragwanath hospital.

2. To review the current literature on the management of DIPG.

**Background:** Diffuse intrinsic pontine glioma remains a devastating disease with very poor prognosis. We present two cases of (DIPG), one an incidental finding in a 5-year-old female and the other in a 3-year-old male as well as a review of current management.

**Methods:** A five year old presented after a fall to the emergency unit as a traumatic brain injury. On examination she had cranial nerve fallout and cerebellar signs. Computerised tomographic scan of the brain (CTB) showed an incidental posterior fossa mass which magnetic resonance imaging (MRI) of the brain favouring a diagnosis of DIPG. The second case was in a 3 year old boy who also presented with cerebellar signs and MRI showed DIPG with hydrocephalus.

**Results:** The second case had a ventriculoperitoneal shunt (VPS) inserted and both were referred to the paediatric oncologist after families were counselled extensively.

**Conclusions:** DIPG in children is a devastating condition with no significant beneficial therapeutic interventions available except for palliative cerebrospinal fluid diversion in appropriate cases. It imparts major stress on families suddenly confronted with a condition that carries such a poor prognosis and from which there is no escape. There are several research projects underway globally that will hopefully improve understanding of this condition and provide new therapeutic methods for its treatment.

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## Paediatric

ePoster presentation

### Trapped fourth ventricle (TFV) syndrome: report of two cases and discussion of the literature

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**Objectives:** 1. To present two cases of trapped fourth ventricle (TFV) with unusual sequel.  
2. To review the current literature on the management of TFV.

**Background:** TFV is a well-documented but rare complication particularly after the insertion of a supratentorial shunt for hydrocephalus. It may also occur after surgeries for posterior fossa tumours, from intraventricular cysts as well as a sequel of inflammatory and haemorrhagic processes that may affect the pathways of the fourth ventricle. It carries great morbidity and mortality when misdiagnosed or mismanaged because of the progressive compression of cerebellum and brainstem. Depending on symptoms it may be managed conservatively or surgically via endoscopy or through open surgical procedures. Management of TFV remains challenging as there are no clear guidelines on the indications or the preferred surgical procedure.

**Methods:** A 3 year old female presented with cerebellar signs, neck stiffness and radiological features consistent with a TFV, without enlargement of the supratentorial ventricular system. She had had a ventriculoperitoneal shunt (VPS) inserted for hydrocephalus at three months of age. She was scheduled for a ventriculocisternostomy which was delayed on account of logistics. She deteriorated acutely and a contrasted tomography scan of the brain (CTB) now showed significant communicating hydrocephalus.

The second case presents a 12 year old female also with VPS insitu for a post haemorrhagic hydrocephalus diagnosed at birth. She had a low Glasgow coma scale (G.C.S) score on presentation and radiological features of a TFV.

**Results:** The first case was managed with insertion of a supratentorial VPS. She improved clinically with resolution of symptoms. Subsequent CTB did not show an increase in size of the TFV.

The second case was treated with a magendieplasty and showed slow steady improvement.

**Conclusions:** TFV is a rare secondary pathology which requires prompt diagnosis and appropriate management as demonstrated by the two cases presented.

1454

## Trauma

ePoster presentation

Pattern and risk factors of post-traumatic seizures in Northern Nigeria: a preliminary result of a prospective single centre study

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**Objectives:** To study the incidence and risk factors of post-traumatic seizures.

**Background:** Post-traumatic seizure (PTS) is a recognized sequelae of TBI that may worsen the progression of secondary brain injury and likely portends poor outcomes.

**Methods:** It is a 2-year prospective observational study of all patients managed by the neurosurgery division; the biodata, mechanism of injury, Glasgow coma scale, onset and type of seizure, computed tomographic finding, serum analytes and management outcome are entered into a pretested pro forma. We are presenting the preliminary results of the first 7 months (November 2022 to May 2023).

**Results:** Thirty-one (18.7%) of the 166 patients managed over the past 7 months had PTS. Most (87%) were males and between the ages of 19-40 years (48%). The most frequent mechanism of injury was motor vehicle accidents (35%) followed by pedestrian (29%) and motorcycle crashes (26%). Most had moderate TBI (38.7%) and the generalized tonic-clonic seizure was the most common seizure pattern (94%) while focal seizures were seen in 6%. Most of the seizures (90%) occurred within 1 week of injury with 65% and 10% occurring within 24 hours and after 1 week respectively. Sixty-one per cent had a CT scan done with the most common findings being frontotemporal contusions and depressed skull fractures. Random blood sugar was mostly within the normal range (42%), hypoglycaemia in 1 patient (3%) and hyperglycaemia in 4 patients (13%). Most (45%) patients had serum sodium within the normal level. PTS patients had a mortality rate of 26% compared with 18.7% of all the TBI patients in this study.

**Conclusions:** This prospective observational study shows the incidence and risk factors associated with post-traumatic seizures in our centre: young males with depressed skull fractures and subdural or epidural haematomas. Active surveillance systems for early detection and protocols for prophylactic anticonvulsants should be implemented.

1455

## Neurovascular Surgery

ePoster presentation

Patient-specific head positioning for aneurysm surgery using a mobile application, measuring scales and 3D-CT angiogram: our initial results

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**Objectives:** We propose a new method of patient-specific head positioning system for aneurysm surgery using measuring scales and a mobile application.

**Background:** Positioning of the head is one of the most critical steps in microsurgery of cerebral aneurysms. There is no patient-specific head position described in the literature. We describe a simple and economical method of obtaining a patient-specific head position.

**Methods:** The preoperative Volume rendering technique (VRT) images showing the basal cerebral arteries together with the bone structure of the cranial base were studied. The image was positioned to have a perfect view of the neck of the aneurysm amenable for ideal clip placement. The same position obtained on imaging was extrapolated on to the patient using a mobile application (App) and two measuring scales.

**Results:** The preoperative imaging of fifty patients with cerebral aneurysms were studied and this novel method was used to obtain a patient specific head position. The patients included 25 ACOM aneurysms, 15 ICA aneurysms and 10 MCA aneurysms. The intraoperative surgical videos were analysed to determine the ease in reaching the neck of aneurysm. This method was very useful and was accurate in reaching the actual surgical neck of the aneurysm with ease in majority of the patients. This method was more useful in ICA aneurysms when compared to other aneurysms in reaching the neck with ease.

**Conclusions:** Positioning of the head is the key step in the microsurgery of cerebral aneurysms. Our method of head positioning derives from simple calculations on CT angiogram which is widely available. It gives a patient specific and aneurysm specific head position which is very important for a clean surgery and good outcome. The utility and applicability of this method to various anterior circulation aneurysms was confirmed in this study.



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## Spine

Oral presentation

Classification of the OLIF corridor and its utility in predicting the ease of surgery

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**Objectives:** Our study devised a new classification system of the OLIF corridor and its utility in patient selection.

**Background:** Oblique Lumbar Interbody Fusion (OLIF) is the latest Minimally invasive option available for lumbar interbody fusion. The presence of a corridor between the prevertebral vascular structures and anterior border of the psoas muscle is a prerequisite for OLIF. We propose a classification for this corridor and its utility in predicting the ease of surgery.

**Methods:** A retrospective analysis of a cohort of 100 patients with lumbar spondylolisthesis at L4 L5 level were included in the study. The OLIF corridor on magnetic resonance imaging (MRI) of these patients were analysed. The OLIF corridor was broadly divided into four groups based upon the location of the vascular structures and the relationship of the psoas muscle with the vertebral body. This classification was prospectively applied to a cohort of 30 patients who underwent OLIF.

**Results:** The distribution of patients in each group were-Type 1 (21%),Type 2A (30%) ,Type 2B (16%) Type 3 (11%) and Type 4 (22%).The mean time taken to dock the retractor was 9.8 minutes for Type 1, 12.4 minutes for Type 2A , 18.7 minutes for Type2B and 31.3minutes for Type 3. The difference in timing was statistically significant. The mean increase in postoperative serum levels of CPK were 1.74 times for Type 1, 1.54 times for Type2A, 2.29 times for Type 2B and 7.21 times for Type 3.The rise in CPK levels was statistically significant.The findings correlated with the type of OLIF corridor.

**Conclusions:** The presence and type of OLIF corridor should be assessed preoperatively before attempting the surgery. The type of OLIF corridor predicted the ease of surgery and the postoperative muscle injury due to manipulation. The type of OLIF corridor helps beginners to choose the cases judiciously.

1458

## Skull Base

ePoster presentation

Patient-reported outcome measure for skull base chordomas and chondrosarcomas: evaluation of current PROMs and outline for a disease-specific PROM

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**Objectives:** To evaluate the relevance of existing PROMs and to develop an outline for a new disease-specific PROM.

**Background:** Patient-reported outcome measures (PROM) are used to assess health-related quality of life (HRQoL) in healthcare and research. There are currently no disease-specific PROMs developed or validated for patients with a skull base chordoma or chondrosarcoma.

**Methods:** A list of 148 general, domain-specific, and disease-specific items was compiled from validated PROMs for other patient groups and generic PROMs. Patients of a tertiary neurosurgery care center evaluated each item on perceived frequency and impact via a paper questionnaire. Relevance of items was calculated multiplying the perceived frequency and impact of each item. New items were identified through semi-structured interviews with patients. Six healthcare professionals rated relevant items on perceived frequency and impact and usefulness in medical practice.

**Results:** Thirty-two patients rated fatigue, pain, impaired functioning, problems with eyes, ears, nose, and/or throat, worrying, negative emotions, and cognitive problems as most relevant to their HRQoL. Five new disease-specific items were identified in the interviews. Patients with chordoma or treated with postoperative proton beam therapy reported more symptoms than patients with chondrosarcoma or after surgery only. The number of relevant items from existing instruments ranged between 7.1% and 80.0%. The input from patients and healthcare professionals resulted in a 28-item list with highly relevant items for assessing HRQoL.

**Conclusions:** HRQoL was assessed and an outline for a PROM was developed for patients with skull base chordoma and chondrosarcoma, valuable in clinical practice and scientific research.

1459

## Trauma

Oral presentation

### Endoscopic assisted evacuation of extradural haematoma

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**Objectives:** The aim is to describe the efficacy of an adapted technique in endoscopic traumatic extradural haematoma evacuation, highlight the learning curve involved and stratify cases with a proposed grading system.

**Background:** Extradural haematomas (EDH) are traditionally evacuated via the open craniotomy technique. With the advent of minimally invasive techniques, we describe an endoscopic technique for the procedure, with safety and efficacy in consideration.

**Methods:** Adult patients between 18 and 65 years presenting to Tygerberg Academic Hospital Cape Town, South Africa with EDH requiring surgical evacuation were selected according to surgeon ability for endoscopic assisted haematoma evacuation between July 2018 and March 2021. Haematoma was approached from its periphery with a 4 cm incision and 2,5 cm disc craniotomy in keeping with the principles of keyhole surgery. A rigid endoscope and suction bipolar system were used to evacuate the haematoma and address the bleeding source.

**Results:** 21 male patients had their extradural haematomas evacuated endoscopically. Mean time to reach the haematoma was 5.75 mins. Mean operating time was 69.3 min. Mean intraoperative blood loss was 248 mm. Mean haematoma evacuation percentage was 84%. One patient was converted from endoscopic to open surgery.

**Conclusions:**

A novel grading system to aid patient selection is proposed

Proposed Tygerberg Grading System

Haematoma location

Pure convexity - 0

Skull base involved - 1

Over dural lake - 2

Over venous sinus - 3

Skull fracture type

None - 0

Simple linear - 1

Comminuted/multiple linear/skull base - 2

Fracture crossing venous sinus - 3

Haematoma Features

Haematoma < 3 cm - 0

Haematoma > 3 cm - 1

Swirl sign present - 2

Pre-Op GCS  
Mild (13-15) - 0  
Moderate (9-12) - 1  
Severe (3-8) - 2  
Total Score | Grade.  
0-2 - I  
3-5 - II  
6-8 - III  
>8 - IV

We recommend that endoscopic assisted evacuation be the procedure of choice for patients with Tygerberg Grade I and II extradural haematomas; and further studies for validation.

1460

## Hydrocephalus

ePoster presentation

Family-base rare variant association analysis in Saudi Arabian hydrocephalus subjects using whole exome sequencing

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**Objectives:** Genetic Analysis.

**Background:** Hydrocephalus is a highly heterogeneous multifactorial disease that arises from genetic and environmental factors. Familial genetic studies of hydrocephalus have elucidated four robustly associated hydrocephalus associated loci. This study aims to identify potential genetic causation in cases of hydrocephalus, with or without spina bifida and Dandy Walker Syndrome (DWS), using family-based rare variant association analysis of whole exome sequencing.

**Methods:** We performed whole exome sequencing in 143 individuals across 48 families where at least one offspring was affected with hydro-cephalus (N.=27), with hydrocephalus with spina bifida (N.=21) and with DWS (N.=3), using Illumina HiSeq 2500 instrument.

**Results:** No pathogenic or putative pathogenic single-nucleotide variants were evident in the four known hydrocephalus loci in our subjects. However, after examining 73 known hydrocephalus genes previously identified from literature, we identified three potentially impactful variants from the cohort. Using a gene panel comprising variants in known neural tube defects loci, we identified a total of 1024 potentially deleterious variants, of which 797 were missense variants and 191 were frameshift variants, 36 were stop gain/loss variants. A small portion of our family pedigree analyses yielded putative genetic signals which may be responsible for hydrocephaly elated phenotypes, however the low diagnostic yield may be due to lack of capture of genetic variants in the exonic regions i.e. structural variants may only be evident from whole genome

**Conclusions:** We identified three potentially impactful variants from our cohort in 73 known hydrocephalus genes previously identified in literature.

1461

## Spine

ePoster presentation

### Median laminotomy approach in surgical treatment of childhood tumors (57 cases)

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**Objectives:** Improving the results of surgical treatment of spinal cord tumors using minimally invasive median laminotomy in children.

**Background:** Problems of post laminectomy syndrome after removal of spinal cord tumors is an urgent problems in spinal neurosurgery. The study and development of new minimally invasive techniques, especially in children, are necessary to preserve the anatomical and functional integrity of the spine.

**Methods:** We reviewed the results of surgical treatment of 57 pediatric patients with spinal cord tumors. According to the localization of the tumor, there were intramedullary (n=19) and extramedullary (n=38). According to the results of histological examination of astrocytomas (n=9), ependymomas (n=26), neurinomas (n=5), vascular tumors (n=4), teratomas (n=3), sarcomas (n=2), AT/RT (n=2). All patients were operated on in the pediatric department of Neurosurgery of the Federal Center of Neurosurgery (Tyumen) in the period from 2011 to 2022 by one neurosurgeon Prof. Sufianov. Radiological data and clinical outcomes were evaluated.

**Results:** According to retrospective analysis midline laminoplastic approach through the spinous section was performed in the cervical (n=11), thoracic (n=18) and lumbar spine (n=28). This method of median laminotomy allows to preserve the integrity of the bone-ligamentous-muscular apparatus of the vertebral-motor segments, which further allows to preserve the supporting function of the spine as much as possible. Thanks to the dilution of the vertebral arches, this method allows us to create a sufficiently wide access to the tumor, which facilitates the work during its removal. When using the method of median periosteal laminotomy, there were no difficulties with the removal of tumors. In the postoperative period, none of the operated children had spinal instability.

**Conclusions:** We recommend the method of median laminotomy as a low-traumatic method used in children with spinal cord tumors.

1462

## Paediatric

Oral presentation

### Exo-endoscopic surgery of a choroid plexus papillomas in children

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**Objectives:** Improving the results of surgical treatment of choroid plexus papillomas using minimally invasive endoscopic methods.

**Background:** Choroid plexus tumors (CPT) is a relatively rare intraventricular tumor of neuroepithelial origin, consist nearly 2% of brain tumors diagnosed in pediatric population. Standard transcalsal and transcortical approaches can lead to seizures, hemiparesis, memory loss, confusion, mutism, disconnection syndromes. Minimally invasive techniques help to minimize brain parenchyma injury.

**Methods:** 11 children with a choroid plexus papillomas were treated between 2011 and 2022 at the Department of Pediatric Neurosurgery of Federal Center of Neurosurgery, Tyumen. For visualization in 3 cases we used exoscope Vitom 3D and in 10 cases - 3 kind of endoscopes: Shuntscope, Lotta endoscope and InVent endoscope BBraun, Gemany). In all cases with exoscope for intraventricular approach was used tubular retractor ViewSite Brain Access System. There were 10 male and 3 female patients, with a mean age of 1,24 years (range 0,1–5). 8 cases of localization in the lateral ventricle and 5 clinical cases in the 3rd ventricle were operated.

**Results:** All operations to remove choroid plexus papillomas were perform with gross total resection. The presence of a vascular pedicle and the development of new tools, like laser, allows you to control bleeding. According to our observations, key factor of surgical resection of choroid plexus tumor is the access to the vascular pedicle. The second important factor is the diameter of the working channel of endoscope, in comparison with the size of the tumor. Using tubular retractor systems help to perform more safety approach to deep lesions. New visualization technology help to perform surgery in more comfortable position and increase resection volume and remove tumor remnants in a limited field of view.

**Conclusions:** Exo-endoscopic surgery help to remove of intraventricular choroid plexus tumors at children with possibility safe surgery and gross total resection.

1463

## Paediatric

Oral presentation

### Exo-endoscopic surgical treatment of craniosynostosis in children

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**Objectives:** Improving the results of surgical treatment of craniosynostosis using minimally invasive exo-endoscopic technique.

**Background:** Craniosynostosis is defined as the premature fusion of one or more cranial sutures leading to secondary distortion of skull shape resulting in skull deformities with a variable presentation. The prevalence of craniosynostosis ranges from 3.1 to 5.06 per 10,000 births. In a recent study, 84% of patients presented with isolated craniosynostosis, 7% with additional clinical symptoms, and 9% with suspected syndromic craniosynostosis.

**Methods:** We have reviewed results of surgical treatment of 591 pediatric patients with craniosynostosis at period from 2011 to 2021 years, who were operated in the pediatric department of neurosurgery in Federal Centre of Neurosurgery (Tyumen, Russia). All patients are divided into 3 age groups: 1 group up to 5 months, the second group from 5 months to 1 year and the third group from 1 year and older. In the first group, all operations were performed with endoscopic technologies. In the third group, all operations were performed by open cranioplasty. Exoscopic and endoscopic surgical treatment was performed for 2 group, respectively. Radiological and clinical outcome data were assessed.

**Results:** In the first group of patients (n=300), we performed endoscopic surgery. In the second group of patients (n=20), exo-endoscopic surgery was performed. In the third group (n=271), open cranioplasty was performed. According to retrospective analysis of craniosynostosis surgery technic 520 out of 591 patients with excellent result, 62 out of 591 patients with good result and 9 - satisfactory result. Intraoperative 3D imaging in high quality allowed surgeons to carefully performed 3D modeling cranioplasty.

**Conclusions:** In our study we have also demonstrated that exoscopic and endoscopic minimally invasive cranioplasty is effective method of cranoplasty in children. Surgeon learning curve.



## Skull Base

ePoster presentation

### Anterior clinoidectomy in pediatric patients: case report and technical nuances

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**Objectives:** Extradural removal of the anterior clinoid process is a complex and important skill for surgery of the base of the skull. However, in children, this manipulation has limited use according to the literature.

**Background:** Extradural removal of the anterior clinoid process is a complex and important skill in operations on the base of the skull. This stage is the first key step towards creating additional space and adequate visualization of the cavernous sinus, internal carotid artery, optic nerve and other structures of the chiasmatal-cellular region. However, according to the literature, this manipulation has limited use in children.

**Methods:** We report the case of a 6 years old girl presented with stenosis of the optic canals with compression of the optic nerves (osteopetrosis) and complication of the main one: partial atrophy of the optic nerves.

**Results:** The patient underwent left sided anterior clinoidectomy with optic nerve decompression. The postoperative period proceeded without complications and the patient was discharged from the department on the 5th day after the operation. In a control study a year later, there was an improvement in vision. The anterior sphenoid process is the terminal part of the small wing of the sphenoid bone and is connected to the sphenoid bone by two roots. It represents the first key step to create additional space for the purpose of adequate visualization of the cavernous sinus, internal carotid artery, optic nerve and other structures.

**Conclusions:** The extradural removal of the anterior clinoid process opens up an anatomical corridor for us, which allows us to safely decompress the optic nerve. Extradural anterior clinoidectomy is an important skill for the treatment of pathologies of the sellar region. An accurate understanding of the microsurgical anatomy of this area, the corresponding surgical nuances and detailed preoperative planning simplifies this surgical stage.

## Paediatric

Oral presentation

Paediatric brain tumour management in low, middle, and high-income countries: a multi-centre, international, cross-sectional study (preliminary results)

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**Objectives:** Analyse the variation in diagnosis and management of paediatric brain tumours worldwide.

**Background:** Tumours of the central nervous system (CNS) are the most common solid tumours in children, make up 20% of all childhood cancers, and cause the largest number of paediatric cancer deaths. There is a paucity of research analysing paediatric CNS tumour diagnosis and management globally.

**Methods:** Data collection consisted of a Qualtrics survey which was disseminated via email to paediatric neurosurgeons worldwide. Questions focused on the diagnostic and therapeutic methods available to treat paediatric brain tumours. Responses were anonymous and no individual patient data was collected. All survey respondents could choose to become named collaborators on this study. Ethical approval was waived by Oxford University.

**Results:** 80 responses from 36 countries have so far been collected, with 26 responses from low income countries (LIC) and lower middle income countries (LMIC) and 54 responses from high income countries (HIC) and upper middle income countries (UMIC). Table 1 summarises differences between these two groups of countries. The proportion of surgeons with a paediatric neurosurgery fellowship was significantly higher in HIC and UMIC ( $p < 0.001$ ). Whilst paediatric neurosurgery is usually performed by paediatric neurosurgeons (68%) in HIC and UMIC, this is largely done by adult neurosurgeons (88%) in LIC and LMIC,  $p < 0.001$ . In terms of diagnosis, there was a significant difference in the availability of MRI ( $p < 0.001$ ), PET scans ( $p < 0.001$ ) and radiologists ( $p = 0.003$ ). Access to a paediatric neurosurgery MDT, availability of chemotherapy and radiotherapy, and follow-up at 1 year, were significantly higher in HIC and UMIC ( $p < 0.001$  for all).

	High income and upper middle income countries	Low and low middle income countries	p-value
Role of survey respondent			<b>0.02</b>
Neurosurgery consultant, n (%)	48 (89)	18 (69)	
Neurosurgery trainee, n (%)	5 (9)	3	
Neurosurgery fellow, n (%)	1 (2)	0 (0)	
Paediatric surgeon, n (%)	0 (0)	4 (15)	
Paediatric surgery trainee, n (%)	0 (0)	1 (4)	
Paediatric neurosurgery performed at centre, n (%)	47 (87)	26 (100)	0.05
Who performs paediatric neurosurgery?			<b>&lt;0.001</b>
Paediatric neurosurgeons, n (%)	32 (68)	2 (8)	
Adult neurosurgeons, n (%)	9 (19)	23 (88)	
Paediatric surgeons, n (%)	4 (9)	1 (4)	
Adult general surgeons, n (%)	0 (0)	2 (8)	
Adult and paediatric neurosurgeons, n (%)	2 (4)	0 (0)	
Presence of neurosurgery trainees at centre, n (%)	50 (93)	20 (77)	<b>0.04</b>
Paediatric neurosurgery fellowship, n (%)	33 (61)	5 (19)	<b>&lt;0.001</b>
Paediatric brain tumours operated on annually by survey respondent, mean (median)	20 (12)	29 (20)	0.3
Available investigations			
MRI, n (%)	53 (98)	18 (69)	<b>&lt;0.001</b>
PET, n (%)	39 (72)	4 (15)	<b>&lt;0.001</b>
Available treatment modalities			
Chemotherapy, n (%)	46 (85)	12 (46)	<b>&lt;0.001</b>
Radiotherapy, n (%)	43 (80)	7 (27)	<b>&lt;0.001</b>
Other treatments, n (%)	24 (44)	6 (23)	0.06
Availability of radiologists			
Radiologists, n (%)	54 (100)	22 (86)	<b>0.003</b>
Neuroradiologists, n (%)	49 (91)	14 (50)	<b>&lt;0.001</b>
Paediatric neuroradiologists, n (%)	30 (56)	4 (15)	<b>&lt;0.002</b>
Discussing with other surgeons			0.6
Colleagues in same country, n (%)	34 (63)	16 (62)	
Colleagues in other countries, n (%)	13 (24)	5 (19)	
No option to discuss, n (%)	6 (11)	1 (4)	
Paediatric neurosurgery MDT, n (%)	46 (85)	10 (38)	<b>&lt;0.001</b>
Follow-up at 1 year, mean	86%	56%	<b>&lt;0.001</b>

**Conclusions:** These preliminary results provide an overview of the key differences in the diagnostic and therapeutic pathways for paediatric brain tumours worldwide. We aim to continue data collection to further our understanding of this global variation.

1467

## Spine

ePoster presentation

Indications of spinal arthrodesis in a country with limited resources in West Africa

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**Objectives:** The authors report the indications for arthrodesis in a spinal surgery center in southern Benin, low and middle country.

**Background:** The osteosynthesis of the spine has undergone a significant evolution since the first attempts at arthrodesis.

**Methods:** This was a descriptive and analytical study with retrospective collection of socio-demographic data, indications and the nature of spinal implants from January 2019 to October 2022. These data were analyzed using SPSS statistics 21 and Excel software 2021.

**Results:** During the study period, 138 files were collected, including 78 men (56.5%) and 60 women (43.5%) with an average age of  $46.96 \pm 15.13$  years (16-78 years). These arthrodeses constituted 48.93% of the operative activity of the spine. The indications for spinal fusion were essentially traumatic (59 cases, 42.75%) and degenerative (72 cases, 52.17%). The cervical segment was affected at the traumatic and degenerative level respectively in 22.46% and 28.26%; the thoracic segment in 9.42% and 3.62% and the lumbar segment in 13.76% and 18.84%. The spinal implants used were a cervical cage (37), a cervical plate (41), a lumbar cage (36) and titanium pedicle screws (530). The graft was autologous (iliac graft) in 53.62% (74) and a bone substitute in 46.37% (64).

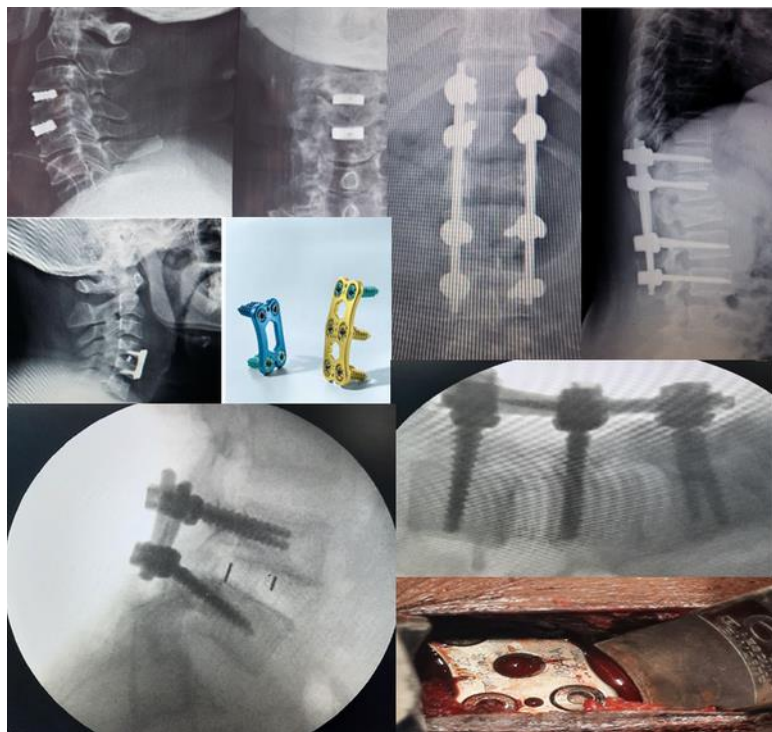


Fig 1 : Some examples of spinal fusions in the Benin spine care center

**Conclusions:** Spinal fusion is a reality in Benin, but the activity remains hampered by the financial accessibility of patients and the frequent unavailability of implants.

1468

## Peripheral

Oral presentation

The effect of bio-cellulose + graphene graft & adipose stem cell on axonal regeneration in experimental sciatic nerve injury

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**Objectives:** In this study; we aimed to elucidate the effect of in-vitro application of a scaffold of biocellulose and graphene oxide (BC+GO) mixture on the axonal healing potential after experimentally induced sciatic nerve injury in Wistar rats, alone or in combination with mesenchymal stem cells taken from rat viscera.

**Background:** Peripheral nervous system injuries cause catastrophic burdens due to the developing loss of function. The most limiting situation in the treatment of injuries is the low ability of the central nervous system to regenerate itself, and most of these damages are irreversible.

**Methods:** This experimental, prospective, randomized study was conducted on 27 male Wistar rats. They were evaluated into three groups, with nine in each group as Group 1 (autograft group), Group 2 (Graft group), and Group 3 (Graft+SC group). Sciatic nerve function index (SFI), EMG, and histopathology evaluation were performed at the end of the 8th week.

**Results:** There was no significant difference in SFI results within the three groups. In the case of EMG, there was a statistically significant difference among the first-month CMAP results of groups. First-month CMAP results of graft and graft+SC groups were significantly higher than the autograft group ( $p=0.0046$ ). During macroscopic observation, graft and graft+SC groups had abundant adhesions around the grafted site. On histomorphology and immunohistochemistry, regenerative findings were obtained in all three groups. The autograft group had no inflammatory response, while the graft group had the highest inflammation and degeneration. In the graft+SC group there were less inflammation than second one, which is a finding thought to be related with immunomodulatory effects of MSCs.

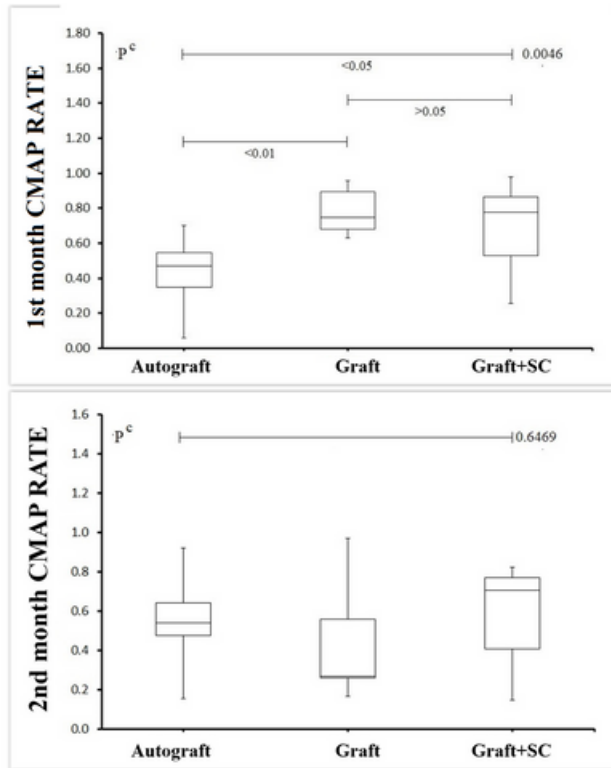


Image: Comparison of

CMAP ratio values of all groups

**Conclusions:** BC+GO graft might be useful in the first weeks of regeneration, but this wasn't sustained in the long-term regenerative findings due to intense inflammatory response and loss of regenerated axonal structures.

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## Spine

ePoster presentation

### Usage of neuronavigation in spine surgery without an O-arm

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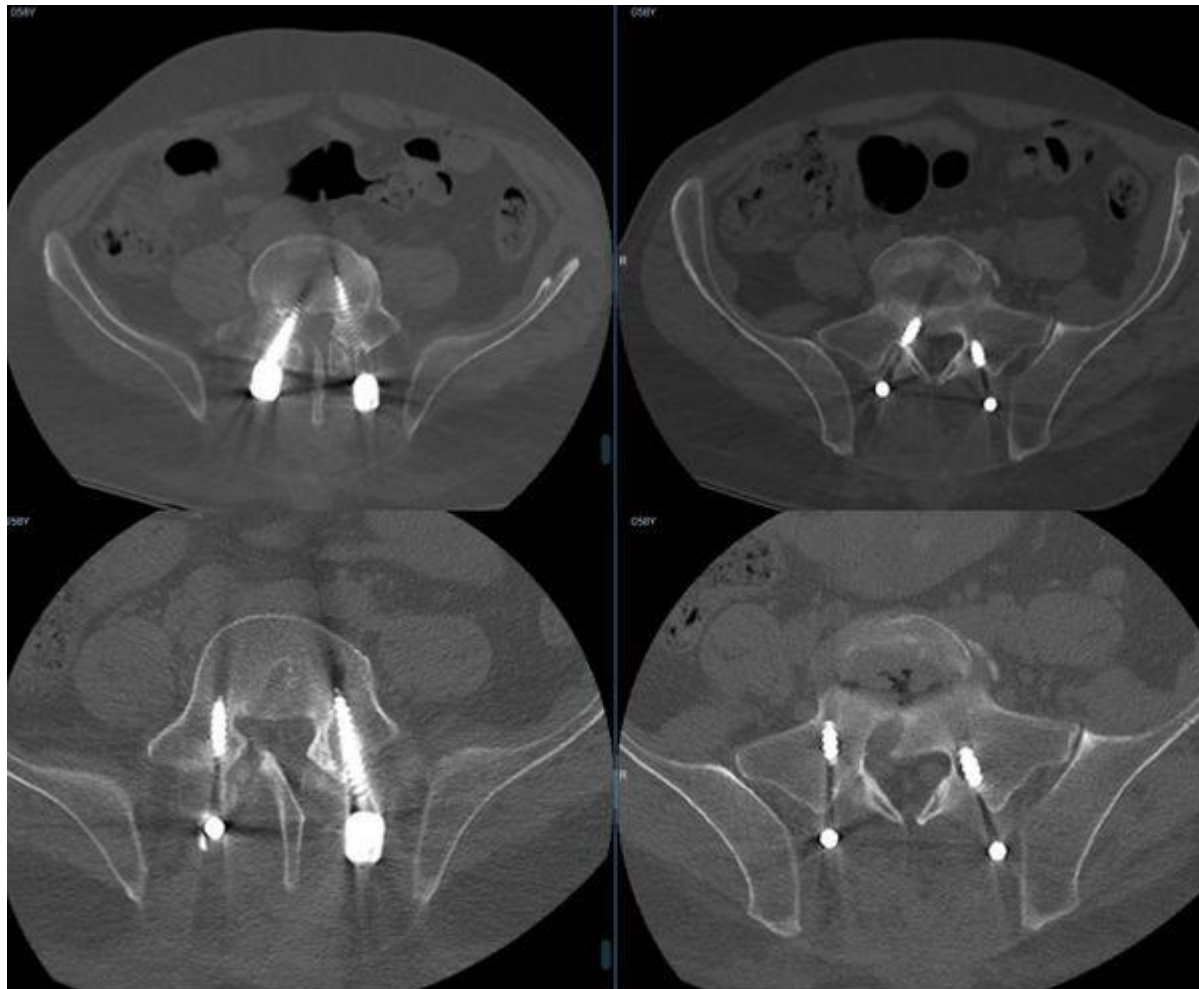
**Objectives:** We intend to evaluate the accuracy and safety of lumbar pedicle screw (LPS) and S1 screw insertion in a revision surgery under infrared optical tracking system based 3-dimensional (3D) navigation guidance. In order for that, we present a case of revision surgery in a patient with a history of multiple lumbar spinal surgery.

**Background:** With the use of intraoperative navigation, advantageous results were obtained for the patient and the surgeon. Surgical procedures performed with navigation in comparison to standard fluoroscopy has the potential to reduce risk of screw misposition, duration of surgery, mean blood loss, exposure to radiation and to reduce complication rates. In literature and common clinical practice, for best orientation and better results, it is suggested that when using spinal neuronavigation, surgeons should also use an O-arm. However in many clinic, and especially in under-developed countries, O-arm is not present or it is not affordable to have both.

**Methods:** This is a case presentation of a revision surgery for bilateral L5-LPS and right S1 screws under intraoperative neuronavigation. The radiological accuracy of screw placement was evaluated comparing his pre- and postoperative CT scans.

**Results:** After surgery patient had significant improvement in complains of neuropathic pain. In postoperative CT, all three revised screws showed no breach (which are grade 0 according to Gertzbaun classification). No subsidence obtained in late control CTs. Postoperatively obtained bone densitometry with T score of -2,6 was concordant with preoperative observation of patient's osteopenic state.





**Image 1:** *Upper row*, preoperative image of L5(left) and S1(right) screws.  
*Lower row*, postoperative images of revised screws, L5(left) and S1(right).

**Conclusions:** In this case navigation is used for three screw revision, and even though it provides limited findings to compare, this usage provided screw placement of Gertzban grade 0 in all three revisions without usage of an O-arm. Using adjacent screws as a guidance can provide sufficient registration points for optical tracking spinal neuronavigation systems and that is why it is possible to use spinal neuronavigation without an O-arm in spinal revision surgeries.

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## Spine

Oral presentation

### Surgical procedure for dropped head syndrome by cervical deformity

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**Objectives:** Dropped head syndrome (DHS) is a condition defined by difficulty of keeping the head up against gravity with severe cervical kyphosis. This study aimed to assess surgical procedures and complications in surgery for DHS.

**Background:** Surgery is planned based on the primary driver. However, effective surgical procedures for DHS are not still established.

**Methods:** We retrospectively analyzed 34 consecutive patients undergoing surgery for DHS by cervical deformity.

**Results:** Surgical procedures were ACDF with PLF in 27, PLF only in 5 and C7-PSO with PLF for rigid deformity in 2. Most of LIV was upper thoracic and more than half of UIV was C3 in surgery of ACDF with PLF. Mean ranges of ACDF were 3 levels and most included C4/5 and C5/6. We performed additional PSO as revision in two patients.

Instrumentation failure at LIV of C7 and insufficient correction. Another two patients presented with postoperative dysphagia. Mild dysphagia was spontaneously recovered in months after multilevel ACDF in one. Severe dysphagia soon after PLF only was resolved by lessening cervical lordosis in the other. Another patient with PLF alone showed the back-out of rostral screws. However, she could not undergo revision surgery because of the onset of cerebral infarction.

**Conclusions:** Multilevel ACDF with PLF is basically recommended in surgery for DHS, in order to keep a great correction of dropped head posture against gravity. LIV is extended to at least upper thoracic spine and ACDF include lower cervical spine because main pathology of DHS is at the cervicothoracic junction. And UIV at C3 may be sufficient when bilateral pedicle screws could be inserted at C3 and C4. Excessive formation of cervical lordosis should be avoided, because it can cause severe dysphagia. Preoperative assessment of swallowing function is necessary in elderly patients for multilevel ACDF.



1475

## Spine

ePoster presentation

Subaxial cervical fixation with screws to lateral masses, a variation to the technique

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**Objectives:** To describe the variant of screw placement technique to subaxial cervical lateral masses, based on the understanding of the anatomical structure of the lateral masses.

**Background:** The lateral mass screw fixation technique (LMSF) is a biomechanically effective management option for subaxial cervical spine pathologies of different nature, tumor, degenerative, traumatic, to name a few.

The mainly known and used techniques are Magerl, Anderson, An and Roy Camile, with the main difference in the entry point as in the divergent direction and the caudocephalic inclination with which the screw is oriented.

**Methods:** We must imagine two lines that divide the lateral mass in two halves, vertically and horizontally, meeting in the center, We propose an entry point in the inferiomedial quadrant with orientation of the screw towards superolateral, in such a way that it presents a divergent angulation of 30-35°, caudocephalic of 50° with orientation towards the most superior, lateral and ventral edge of the lateral mass in question.

**Results:** One technique does not necessarily displace another, as an example in our experience the classic Roy Camile technique can be used as a rescue strategy in cases where the proposed technique has not given good results, on the other hand this technique can be combined with others as for 360° approaches to the cervical spine in combination with an anterior cervical approach, as well as in occipitocervical fixations.

**Conclusions:** This technique has a theoretical basis and has given encouraging results in practice, there are still not enough cases to express significant statistics that can be compared, factors such as the design of the implants, the material of which they are made should be considered, considering that the closer their density is to the bone density, independently of the alloys used to develop them, the better the results will be.

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## Functional

Oral presentation

### Dorsal Root Entry zone lesioning for brachial neuralgia

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**Objectives:** This study was performed to evaluate the efficacy of Microscissor DREZotomy (MDZ), a new technique developed at our institution, in patients with post brachial plexus avulsion (BPA) neuropathic pain.

**Background:** Brachial Neuralgia is a dreaded sequela substantially impairing the quality of life in patients with BPA injuries. This pain is often refractory to medical therapy and Dorsal Root Entry Zone lesioning of the cervical spinal cord is the one of the most utilized procedure for alleviating this painful condition.

**Methods:** This retrospective analysis included patients undergoing MDZ for brachialgia following BPA, operated between 2014-2019. MDZ is performed with microscissors along the posterolateral sulcus (PLS) of spinal cord. The pain was quantified by the patients using the Visual Analog Scale (VAS) between 1 to 10 scale; grade-1: No pain and 10 corresponding to maximum pain. The VAS grading was retrieved from the Computerized Patient Record System (CPRS), case files and records pre and post-surgery and at followup, as well as from telephonic conversation. The VAS score was graded as 'Excellent' in patients with more than 75% pain relief, 'Good' with 50-75% relief, 'Fair' between 25-50% and 'Poor' if less than 25%.

**Results:** A total of 58 patients underwent DREZ (Cervical) and follow up is available for 47 patients with a mean follow up period of 32 months (range 6-69 months). 33 patients (70.2%) judged pain relief as Excellent, Five (10.6%) as Good, 3 (7%) as Fair and 6 (12.2%) having poor pain relief. Overall, in 38 (81%) patients long term analgesic effect (> 50%) following MDZ was noted and 3 (7%) patients had more than 25% pain relief, making up an overall 41 (87%) of patients with some pain relief

**Conclusions:** Microscissor DREZotomy is a safe, efficacious technique and entails utilization of routine microsurgical instruments which can be performed even in resource-limited settings.

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## Skull Base

Oral presentation

Patterns of response after Gamma Knife Radiosurgery in cases of cavernous sinus lesions

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**Objectives:** Gamma Knife Radiosurgery (GKRS) is a commonly used modality for treating patients with cavernous sinus (CS) lesions. Our aim was to evaluate the response in different tumor types.

**Background:** When treated primarily, a diagnosis of either Meningioma, Hemangioma or schwannoma may not be made. Response to these tumor types is different after GKRS and knowing response rates is crucial for Counselling patients about prognosis.

**Methods:** We did a retrospective chart review of all patients who underwent GKRS for cavernous sinus tumors in our institute from 2006 to 2021. All patients with a minimum clinical and radiological follow-up of 6months were included. Tumor control and clinical recovery were evaluated.

**Results:** 105 patients with CS tumours were treated in the study period. 17 patients were excluded due to unavailability of data. 38 were meningiomas, 8 schwannomas and 42 hemangiomas in the study. The median follow-up available was 22 months. Progression-free survival was 100% for cavernous sinus hemangiomas at a median follow-up of 38 months, 96% for meningiomas at a median follow-up of 32 months and 100% for schwannomas at a median follow-up of 30 months. Cranial improvement was seen in all lesions with the fastest improvement seen in hemangiomas. When compared longitudinally, hemangiomas showed the most rapid response to treatment followed by Schwannomas. Complete disappearance of lesion happened only in hemangiomas compared to other tumour types.

**Conclusions:** Cavernous sinus hemangiomas have a rapid and complete response compared to schwannomas and meningiomas. The improvement in cranial nerve palsies happened faster and more dramatic. Its important to counsel patients according to their probable diagnosis rather than including all cavernous sinus lesions together. Radiologists play an important role in diagnosis based on imaging so that patients can be counselled accordingly.

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## Trauma

Oral presentation

Evacuation plus adjuvant cisternostomy vs evacuation alone for acuted sub dural haematoma in moderate to severe traumatic brain injury patients

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**Objectives:** To compare the neurological outcomes of patients presenting with Acute Subdural Haematoma (ASDH) who underwent SDH evacuation alone Vs Evacuation plus Cisternostomy (CS) as an adjunct procedure.

**Background:** CS in TBI has its' own benefits specially under low resource settings.

**Methods:** Retrospective analysis of 140 patients who underwent surgical treatment for ASDH over 6 years who met inclusion criteria and completed 6 months follow up. This was a Single surgeon multi-centre study where the author initially practised evacuation only for ASDH but then shifted to practice CS as an adjunct following evacuation. There were 74 patients in Evacuation Only (EO) group and 66 patients in Evacuation+CS group (EC). Comparison done for two groups in terms of Hospital stay, 30-day Mortality and GOS-E at 1 month, 3 months and 6 months follow up. Both groups were analysed for common post-operative complications such as Hydrocephalus, wound infections, CSF leak and bone flap complications.

**Results:** EC group showed significantly shorter hospital stay at analysis (P=0.045). There was no significant difference in 30-day mortality between two groups.

The number of patients who had a GOS-E score of 5 or more (favourable functional outcome) were significantly higher at 1 month, 3 months and 6 months follow up in EC group (p values of 0.01, 0.027, 0.047 respectively) compared to EO group.

In EO group, bone flap was replaced only in 20/74 cases but replaced in 58/66 in EC group.

EC group showed lower incidence of post-operative Hydrocephalus at the end of 6 months which was significant (P=0.037).

No difference in wound infections between two groups noted.

**Conclusions:** Cisternostomy as an adjunct procedure in addition to haematoma evacuation in ASDH can be considered as a promising technique that shows improved outcomes in both short and long run as well as having economic advantages specially for low resource centres.

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## Trauma

Oral presentation

Fall from height in pediatric age group: a retrospective review from a tertiary neurosurgical centre in India

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**Objectives:** Unintentional falls from height are a major cause of pediatric traumatic injury. This retrospective study was undertaken to investigate the characteristics, clinic-radiological features and associated outcomes in a tertiary referral neurosurgical center.

**Background:** Children constitute almost one-third of the total population in India. Unintentional falls is one of the leading cause of injury in the pediatric population especially in the developing countries.

**Methods:** This study is a retrospective review of children below 16 years who presented to our neurosurgery referral center from January 2018 to 2019 with a history of falls from height. The demographic data, clinical parameters at presentation, imaging findings, clinical status at discharge and outcome at the follow-up period were analyzed.

**Results:** Of the 1310 children with a history of neurotrauma, 520 (39.7%) of them had a history of falls from height, among which 67% were falls from short height. The mean age was  $5.99 \pm 4.9$  yrs. 82.8% of children had mild, 13.8% moderate and 3.2% had severe head injury. The imaging findings were normal in 59%, subgaleal hematoma in 18.6%, Extradural Hematoma in 9.9%, and Spinal injuries in 1.4%. The regression analysis showed age, gender, the height of the fall, loss of consciousness and seizure as predictors of the severity of the head injury. The Median GOSE at the follow-up period was one. 2.3% of children had mortality within 1 week after the injury. The midline shift and associated injury had a significant impact on the outcome.

**Conclusions:** In our retrospective study age, gender, height of fall, loss of consciousness and seizures were associated with severity of head injury. Presence of midline shift and other associated injuries was associated with outcome at follow-up.

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## Trauma

Oral presentation

100 cases of cisternostomy performed at a peripheral tertiary care centre under limited resources

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**Objectives:** To evaluate the value of Cisternostomy (CS) in the management of patients with severe Traumatic Brain Injury (sTBI) in terms of neurological outcome and procedure related complications.

**Background:** CS is a novel technique in sTBI with unique advantages.

**Methods:** Retrospective analytical study of 100 patients presented with sTBI (GCS<8) treated with CS (for similar indications as for a Decompressive Craniectomy) by a single surgeon over 3 years.

Following adequate craniotomy and dural opening with evacuation of haematoma and contusions where indicated, CS done in standard fashion.

Clinical outcome measures studied were 30-day mortality, length of hospital stay, extended Glasgow outcome scale (GOS-E) at 6 months. Post operative complications were analysed.

**Results:** Study included 69 males and 31 females with Mean age of 44.45 years. Mean operative time was 84.5 minutes.

Average hospital stay was 9.68 days and average ICU stay 3.13 days. Mortality at 1 month was 7%(7/100) and 10% at 6 months.

62% patients (62/100) showed a score of equal to or >5 according to GOS-E scale at 6 months, which was considered a favourable outcome. Bone flap replaced in 84 cases (84%) (fixed in 54 and left floating in 30 cases).

77/100 cases at 6 months follow up showed good healing without any bone flap complications. Bone flap was removed in 5 cases due to infection during 6 months follow up.

4/100 cases developed CSF leak and 6/100 cases developed superficial wound infection and underwent re-do surgery during follow up.

Post -op hydrocephalus was noted in 7 patients (7%) at 6 months, out of which 3 patients needed VP shunt.

**Conclusions:** Cisternostomy can be considered as a viable and safe technique in sTBI with reasonably good short- and long-term clinical outcomes and reasonably low rate of common procedure related complications. It has the economic advantage of avoiding a Cranioplasty in most cases.



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## Oncology

ePoster presentation

### Emergency surgical management of meningiomas: factors affecting early outcomes and complications

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**Objectives:** This study aims to present our experience of urgent surgical intervention in patients with meningiomas presenting acutely. We also analyze the factors influencing early neurological outcomes and complications.

**Background:** Intracranial meningiomas constitute a third of all brain tumours and are among the most common indications for neurosurgical procedures performed worldwide. Most meningiomas present with an indolent, long-standing history. However, the data on outcomes of emergency surgeries for meningioma is limited.

**Methods:** All non-elective, meningioma surgeries done on an emergency basis between Jan 2015 to Dec 2019 were retrospectively reviewed. Patients' demography, clinical, and radiological details were recorded for analysis. The surgical procedure, complications and follow-up outcomes were also included for statistical comparison.

**Results:** Forty-four patients qualified for the study with a mean age of  $49.4 \pm 13.4$  years. The average presenting GCS was 13; 47.7% of cases presented with altered sensorium. The most common lesion location was convexity (25, 56.8%), and the mean tumour volume was  $74.1 \pm 36.5$  cc. Gross peri-tumour oedema with mass effect was seen in 16 patients (36.4%). The mean KPS at three months follow-ups was  $89.3 \pm 18.2$ . Patient age and tumour size did not affect outcomes. The presenting GCS of  $< 15$  (OR 8.8, CI 0.95-80.72, p 0.03) and the occurrence of postoperative complications (OR 25.71, CI 2.65-249.2, p 0.001) were associated with unfavourable outcomes. Although not statistically significant, a poor tumour grade was also associated with worse clinical outcomes (p 0.20).

**Conclusions:** Emergency meningioma surgery has comparable outcomes and complication rates with routine elective procedures. Grade II/III meningiomas are more likely to present with acute neurological deterioration and carry a relatively worse prognosis. Poor presenting GCS and post-operative complications are the most critical factors associated with poor patient outcomes in our study.

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## Paediatric

Oral presentation

Diffuse Intrinsic Pontine Gliomas: to biopsy or not to biopsy, results at a tertiary health care center

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**Objectives:** To study the yield rate of biopsy and complications rate in patients with DIPG.

**Background:** Despite recent studies to understand the molecular basis of diffuse intrinsic pontine gliomas(DIPG), the entity still remains vastly unexplored due to limited role of biopsy in patients with DIPG. The deep-seated location, infiltrative nature and characteristic imaging feature precludes surgical resection or biopsy. To unravel the enigma this disease is and to take a step forward to improve the prognosis of patients with DIPG, routine biopsy and molecular profiling is imperative.

**Methods:** We performed a prospective analysis of patients, both children and adults, who underwent biopsy for DIPG (2018-2023) to study the yield rate and associated morbidity.

**Results:** A total of 122 patients were included. (Mean:17years). Sixty-four patients underwent biopsy. Eighty-seven were children with the mean age of 9.3 yrs. Shunt was done in 16 patients and median survival was 8.3 months. RT was not possible in 32.8% of patients. Twenty-nine had H3K27 altered status and was significantly associated with worse prognosis. Thirty-eight were adults with the mean age of 35.2 yrs. Two required VP shunt and median survival was 14.7 months. Seven of 23 biopsied patients had H3K27 altered status and was significantly associated with worse survival. There were 4 negative biopsies (success rate 94%). There were no permanent surgery related complications.

**Conclusions:** Brainstem biopsy is a safe procedure under a trained neurosurgical team. Molecular profiling can help us to identify relevant targets and will pave the way towards development of targeted treatment.

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## Spine

Oral presentation

### Clinical outcome in decompression alone versus decompression and instrumented fusion in patients with isthmic spondylolisthesis: a prospective cohort study

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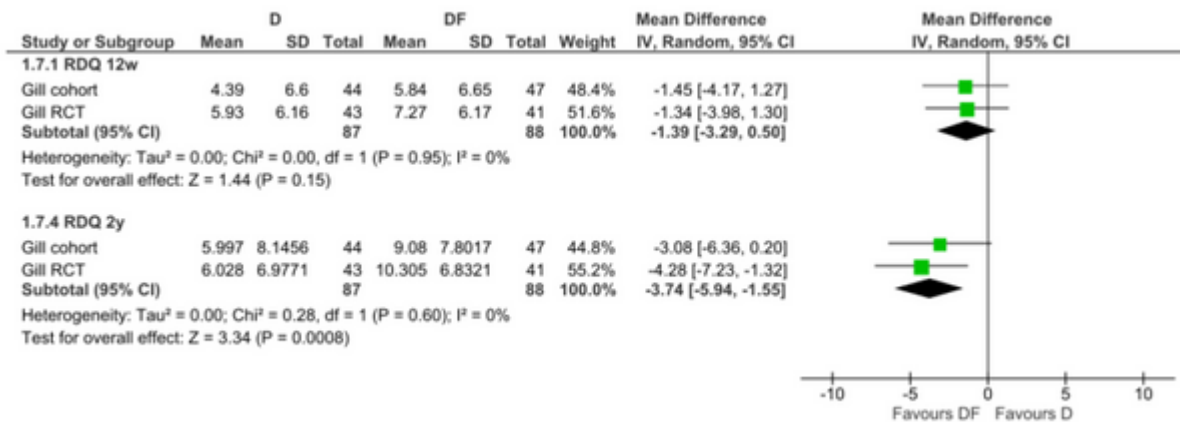
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**Objectives:** To assess long-term effects of decompression-alone compared with decompression and instrumented fusion in patients who underwent the intervention of their own preference. The results were compared with those in patients who underwent randomly assigned treatment.

**Background:** In the surgical treatment of isthmic spondylolisthesis, it is debatable whether instrumented fusion is mandatory in addition to decompression.

**Methods:** A prospective multicenter cohort study was performed, including 91 patients with isthmic spondylolisthesis assigned to undergo either decompression-alone (D-group, n=44) or decompression and fusion (DF-group, n=47). Main outcomes were Roland-Morris Disability Questionnaire (RDQ) scores and patient's perceived recovery at 2-year follow-up. Secondary outcomes were visual analog scale (VAS) leg pain and back pain and the reoperation rate. A meta-analysis was performed for data from this cohort study and from a randomized controlled trial (RCT). Subgroup analyses were performed on various parameters.

**Results:** At 12-week follow-up, improvements of RDQ scores were comparable (D-group 4.4, 95% CI 2.3-6.5; DF-group 5.8, 95% CI -4.3 to 1.4; p=0.31). Likewise, VAS leg pain scores and VAS back pain scores were comparable. At 2-year follow-up, there were no significant differences between the two groups in terms of scores for RDQ, VAS leg pain and back pain. Contrarily, patient-perceived recovery from leg pain was higher in the DF-group (79% vs 51%, p=0.02). Subgroup analyses did not demonstrate a superior outcome for decompression-alone compared with decompression and fusion. Nine patients in D-group (20.5%) underwent reoperation. The meta-analysis yielded an estimated pooled mean difference in RDQ of -3.7 (95% CI -5.94 to -1.55, p=0.0008) in favor of decompression and fusion at 2-year follow-up.



**Conclusions:** Decompression and fusion showed superior functional outcomes compared to decompression-alone. No subgroups benefited from decompression-alone. Therefore, decompression and fusion is recommended over decompression-alone as a primary surgical treatment option in isthmic spondylolisthesis.

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## Oncology

ePoster presentation

### Resection and reconstruction of a giant complex plasmacytoma of the cranium

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**Objectives:**

Report a case of a giant plasmacytoma of the cranium and detail the resection and reconstruction steps used.

**Background:**

Plasmacytomas are tumours of the plasma cells which can occur in soft tissue or bone as part of a spectrum ranging from a solitary lesion to multiple myeloma. Our case is the largest reported plasmacytoma affecting the skull found in the english literature to date. Due to the large and destructive nature of the lesion 3D printing technology was used to aid in the resection and reconstruction of this case.

**Methods:** Case report.

**Results:** The case is of a 50 year old male who presented with a two year history of a progressively enlarging exophytic occipital mass. Neuroimaging revealed a 13cm x 12cm x 6cm extra-axial mass which eroded through the occipital and posterior parietal bones. The lesion caused anterior displacement of the superior sagittal and transverse sinuses with compression of the torcula. The patient was clamped in prone position with a mayfield clamp and a linear occipital incision was used to expose the tumour. Gross total resection was achieved without dural breach or injury to the venous sinuses. 3D printing technology was used to great a surgical guide to aid in clear bone resection margins as well as reconstruction of the defect. Immediate cranioplasty was performed using a polymethyl-methacrylate cranioplasty cement implant made from the 3D printed mould. A great cosmetic result and clear post operative scan was achieved.

**Conclusions:**

This illustrative case report shows the advantages and technique of using 3D printing technology to guide surgical resection and reconstruction of large complex tumours of the cranium.

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## Global Neurosurgery

Oral presentation

A retrospective cohort study of minimally invasive spine surgery in Nigeria

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**Objectives:** To describe our minimally invasive spine surgery (MISS) experience in Nigeria, a developing country, and present the associated perioperative parameters and complication rates.

**Background:** MISS has gained traction since its introduction into spine surgery, resulting in reduced collateral tissue damage and morbidity, and a faster functional recovery than the traditional open approaches. It was only recently introduced in Nigeria, where it is rarely performed. In a bid to improve access to state-of-the-art neurosurgical services in his home country, the lead author, having practiced MISS in the United States, started performing it in Nigeria in 2017.

**Methods:** A retrospective review of our database for patients who had MISS for degenerative spine disease involving the sub-cervical regions from April 2017 to May 2022. Their demographic and perioperative data were analyzed (statistical significance set at  $p < 0.05$ ). The same lead surgeon performed the procedures with similar operative techniques and perioperative management.

**Results:** The data of the 141 patients were not normally distributed. The median age was 62 years; males comprised 55.3%. Half the patients had minimally invasive (MIS) laminectomy, while 46.1% and 3.5% had MIS transforaminal lumbar interbody fusion (TLIF) and MIS-microdiscectomy, respectively. Most (73.8%) were in the lumbar spine, 24.8% involved the lumbosacral junction, and 1.4% were in the thoracic spine. MISS was performed for one- (56.7%) or two-level (43.3%) disease. Median surgery duration (SDn), estimated blood loss (EBL), and length of hospital stay (LOS) were 115 min, 50 mL, and 3 days, respectively. Malpositioned screw, pulmonary embolism, and dura tear rates were 1.4% each, while surgical site infection and nerve injury occurred in .7% each. MIS-laminectomy and MIS-microdiscectomy were grouped into MIS-decompression, and MIS-TLIF demonstrated higher SDn, EBL, LOS (all  $p < 0.001$ ), and complication rates ( $p = 0.024$ ) than MIS-decompression.

**Conclusions:** MISS is available in Nigeria and is characterized in our practice by satisfactory perioperative parameters and complication rates.

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## Global Neurosurgery

Oral presentation

Minimally invasive transforaminal lumbar interbody fusion in Nigeria - a direct cost, perioperative parameter and complication rate analysis

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**Objectives:** To review the direct hospital costs, perioperative parameters, and complication rates of minimally invasive transforaminal lumbar interbody fusion (MISTLIF) in our practice in Nigeria, a developing country, and compare them with the data from our past practice in the United States (U.S.).

**Background:** While spine surgery is expensive, the total cost of patient care for undergoing minimally invasive spine surgery (MISS) is generally lower than for open spine surgeries, mostly related to decreased length of hospital stay (LOS), operative time, perioperative morbidity, and narcotic pain medication use. Due to prohibitive costs, both surgery types are not easily accessible in developing countries.

**Methods:** The hospital's accounts section provided the direct costs for patients who had MISTLIF at our hospital from June 2018 to May 2022. These were converted from Nigerian Naira to U.S. Dollar (exchange rate fluctuations and inflation considered), analyzed with demographic and perioperative data, and compared with our past cohort (statistical significance— $p < 0.05$ ). Both cohorts were similar and had the same lead surgeon, with similar operative techniques and perioperative management.

**Results:** The mean age of the 65 patients was 60.5 years, and 37 of them were female. Mean cost, LOS, estimated blood loss, surgery duration, and complication rates (past cohort data and comparison p-values) were \$9,533 (\$20,960,  $p < 0.001$ ), 4.1 days (3.6 days,  $p = 0.554$ ), 105.0 mL (95.0 mL,  $p = 0.242$ ), 186.0 min (161.0 min,  $p < 0.001$ ), and 10.8% (7.0%,  $p = 0.234$ ), respectively.

**Conclusions:** MISTLIF direct costs are lower in our Nigerian practice than those from a developed country. Most of the reduced costs are associated with lower hospital charges and probably costs of consumables, given comparable perioperative parameters and complication rates. MISS is feasible in a developing country, with good outcomes and at reasonable costs. This may encourage more patients to access this treatment in their home country instead of traveling far in pursuit of MISS.

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## Spine

Oral presentation

Non-invasive intracranial pressure waveform morphology analysis in Chiari type 1 disease patients submitted to foramen magnum decompression

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**Objectives:** This study aims to evaluate the behavior of ICP waveform (ICPw) morphology following foramen magnum decompression.

**Background:** The Chiari type 1 (CM 1) pathophysiology is not well-known and there are many hypotheses on symptoms development. Brain compliance impairment is one of the main hypotheses. However, it is challenge to evaluate brain compliance noninvasively. Recently, a new device came to the market claiming the estimation of ICPw noninvasive, therefore, we aim to evaluate the behavior of the ICPw morphology in the pre and postoperative time following Chiari type I surgery.

**Methods:** We evaluated ICPw and extracted the P2/P1 ratio in lying and sitting position preoperative and 6 months after surgery. The method is characterized by a highly sensitive strain gauge device attached to a strip to the skull. R software was utilized applying mixed effects models to evaluate different moments and positions.

**Results:** 29 patients were recruited. No statistical differences in P2/P1 ratio were detected in lying and sitting positions comparing pre and post-op periods. Eight patients had a pre-op P2/P1 ratio higher than 1.2 in a lying position, a threshold considered representative of low brain compliance, and only two patients had post-op P2/P1 decreased below 1.2. Between normal parameters, 7 were worse and 11 were kept normal. In the sitting position, 14 patients had initially >1.2 P2/P1, and 6 improved post-operatively.

**Conclusions:** Non-invasive ICPw analysis from symptomatic CM 1 suggests no improvement of brain compliance following FMD. Some hypotheses for that conclusion are: 1. Chronic compromise of nervous tissue elastance, 2. Altered CSF flow amplitude and compliance triggered only by the Valsalva maneuver and higher descent of tonsils, 3. Highly effective adaptative mechanism of brain tissue before compliance compromise. Future research could predict response of the patients to FMD and need for complementary treatment before.

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## Paediatric

Oral presentation

Correlation analysis of ventricular anatomical variants during ETV and CPC procedures in hydrocephalus patients post myelomeningocele repair using FIESTA-C/CISS MRI

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**Objectives:** The purpose of this study was to determine the sensitivity of FIESTA-C/CISS MRI in detecting anatomical variants that could have surgical implications during ETV and CPC.

**Background:** Hydrocephalus following myelomeningocele repair is commonly associated with variable intracranial anomalies, which can make the management of hydrocephalus by endoscopic third ventriculostomy (ETV) and/or choroid plexus cauterization (CPC) technically challenging. Consequently, this can lead to an increase in the morbidity associated with surgical procedures.

**Methods:** A prospective study was conducted over a three-year period on 23 patients with hydrocephalus following myelomeningocele repair. All patients underwent FIESTA-C/CISS MRI before ETV and/or CPC. Anomalies in the intraventricular pathway of ETV or CPC were assessed and compared to previous MRI findings to evaluate its sensitivity.

**Results:** All patients included in the study had a mean age of  $3.23 \pm 1.1$  months. There were 11 males (47.8%) and 12 females (52.2%). One patient had agenesis of the foramen of Monro and underwent CPC, while the remaining 22 patients had ETV and CPC. Anatomical variants of the lateral and third ventricles were recorded during endoscopy and compared with MRI readings. The sensitivity of FIESTA-C/CISS MRI for detecting anatomical variants was as follows: body of the fornix (52.2%), septum pellucidum (82.6%), foramen of Monro (91.3%), third ventricle size (90.9%), massa intermedia (86.8%), thickness of the floor of the third ventricle (86.4%), inclination (90.9%), prepontine space size (100%), and presence of arachnoid membranes (81.8%).

**Conclusions:** Intraventricular and CSF-related anatomical variants can be detected by FIESTA-C/CISS MRI studies when applied before endoscopy. Due to the high sensitivity of FIESTA-C/CISS MRI, the application of this data provides prospects for surgical planning and increases the success rate of ETV and/or CPC.



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## Global Neurosurgery

Oral presentation

Intracranial suppurations, retrospective study of 18 years in Ibn Tofail Hospital, Marrakech

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**Objectives:** Enlighten the epidemiological, clinical, radiological and treatment's features.

**Background:** Cerebral abscesses and empyema are rare intracranial suppurations with serious neurological impact. The therapeutic attitudes are controversial.

**Methods:** We analyzed in retrospective study at the Neurosurgery department of the IBN TOFAIL HOSPITAL MOHAMMED VI UNIVERSITY HOSPITAL of Marrakech the files of 210 patients from January 2004 to December 2021.

**Results:** For abscess, average age was 27 years. The age group of 0-10 years was the most affected with a male predominance. Otogen infection was the most frequent etiology (28.25%). Average age for empyema was 21 years. The age group of 10-20 years was the most affected with a male predominance and the otogen infection was the most frequent etiology (29.16%), followed by sinus infection (23.61 %). The triad of BERGMAN was present only in 26.08% of cases of abscesses and in 44.44% cases of empyema. Diagnosis was confirmed on CT scan of the brain 130 cases of abscess and 66 cases of empyema, and the majority were sustentorial in 84.78 % of abscesses and 91.66 % of empyema. The pathogenic agent was identified only in 14,76 % of cases.

118 patients with abscess were treated surgically and 20 treated with antibiotic therapy alone. Evolution was good in 78,98 %. 63 patients with empyema were operated and 09 patients benefited from antibiotic treatment alone. Evolution was good in 79,16 % of cases, complications in 20,83%.

**Conclusions:** Intracranial suppurations are not rare in our epidemiological context. Multidisciplinary management is required. ENT infections remain the main entry point. New imaging techniques are now being used to diagnose. Early diagnosis and treatment is the key for favorable outcome.

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## Paediatric

Oral presentation

Analysis of high-frequency intracranial pressure data and mortality in 364 children with severe traumatic brain injury

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**Objectives:** In this study we report the largest cohort of children with severe traumatic brain injury (TBI) with high frequency ICP data to date. We aimed to 1) describe the temporal profile of ICP, 2) determine the association between ICP and mortality using a time-severity index, and 3) to investigate the impact of age categories.

**Background:** Intracranial pressure (ICP) treatment is a cornerstone of severe TBI management, but although critical ICP thresholds are thought to be different in children, targets are unclear because of the lack of large scale, high quality data and analysis. Cohort sizes in children with high frequency data analysis have been small.

**Methods:** Raw ICP data were recorded at 100Hz frequency and smoothed for export. The extent and duration of elevated ICP were calculated as % time and number of episodes spent > 12, 15, 20, 25 and 30 mmHg thresholds for the whole cohort and in age bands <3, 3-5, 6-10 and >10 years. Associations were analysed using Mann-Whitney's U and visualised using receiver-operating characteristic (ROC) curves.

**Results:** More than 17 million ICP datapoints in 364 sTBI children (<13 years old) were examined. ICP was higher, and elevated for longer, in patients who died. Median ICP was 10.69 mmHg in survivors and 19.21 mmHg in patients who died ( $p < 0.001$ ). ICP associated with mortality at substantially lower thresholds than current recommendations for initiating treatment. Differences between age categories were not possible to define due to limited subgroup numbers. ROC curve predictive value related to the number of datapoints in each age category.

**Conclusions:** This is the largest paediatric sTBI study of this kind. The data suggest a re-evaluation is needed for recommended treatment thresholds in children, but more data are needed to define potential difference in age categories.

1496

## Trauma

Oral presentation

### Low velocity civilian gunshot wounds to the cranio-cervical junction

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**Objectives:** We present a retrospective case series of patients who survived CCJ gunshot injuries from 2015 to 2022, who presented to the neurosurgical unit at Tygerberg Hospital, Cape Town, South Africa.

**Background:** In the Western Cape, South Africa, spinal gunshot injuries are common and typically seen in young males. Cervical gunshot injuries may pose a big threat as vital vascular and neurological structures are in close proximity to the spine and base of the skull. Craniocervical junction (CCJ) gunshot wounds are rarely survivable and in the rare occasion patients do survive, these injuries appear to be biomechanically stable in the majority of cases. We aim to provide a series of gunshots to the CCJ and their subsequent surgical strategies and outcomes, from a South African perspective.

**Methods:** All the patients were clinically and radiologically evaluated, their triage and admission notes reviewed, and their data captured on a REDCap® database. The imaging modalities used included plain radiographs and computed tomography (CT).

**Results:** All patients were males with a mean age of 26.5 years (19-36 years). Five patients (41.7%) were intubated at the scene. Complete spinal cord injury (SCI) was seen in 1 patient (8.3%), while incomplete SCI and the absence thereof was seen in 5 (41.7%) and 6 patients (50.0%), respectively. Seven vertebral fracture patterns were identified, of which unilateral lateral mass and posterior elements were mostly encountered. Concurrent esophageal injury was seen in 2 patients (16.7%), while vascular injury was seen in 4 patients (33.3%).

**Conclusions:** Although CCJ wounds are more likely to present with neurological deficits, their stability tends to be intact. This can be ascribed to the ligamentous complex in the CCJ, that remains undamaged, even with anterior vertebral destruction. CCJ gunshots do not necessarily need immediate surgical intervention, if any, at all and adequate resuscitation is necessary to prevent secondary neurological injuries.

1497

## Oncology

ePoster presentation

Temozolomide + Metformin or other biguanide is superior to Temozolomide as treatment of glioblastoma in GBM models - systematic review

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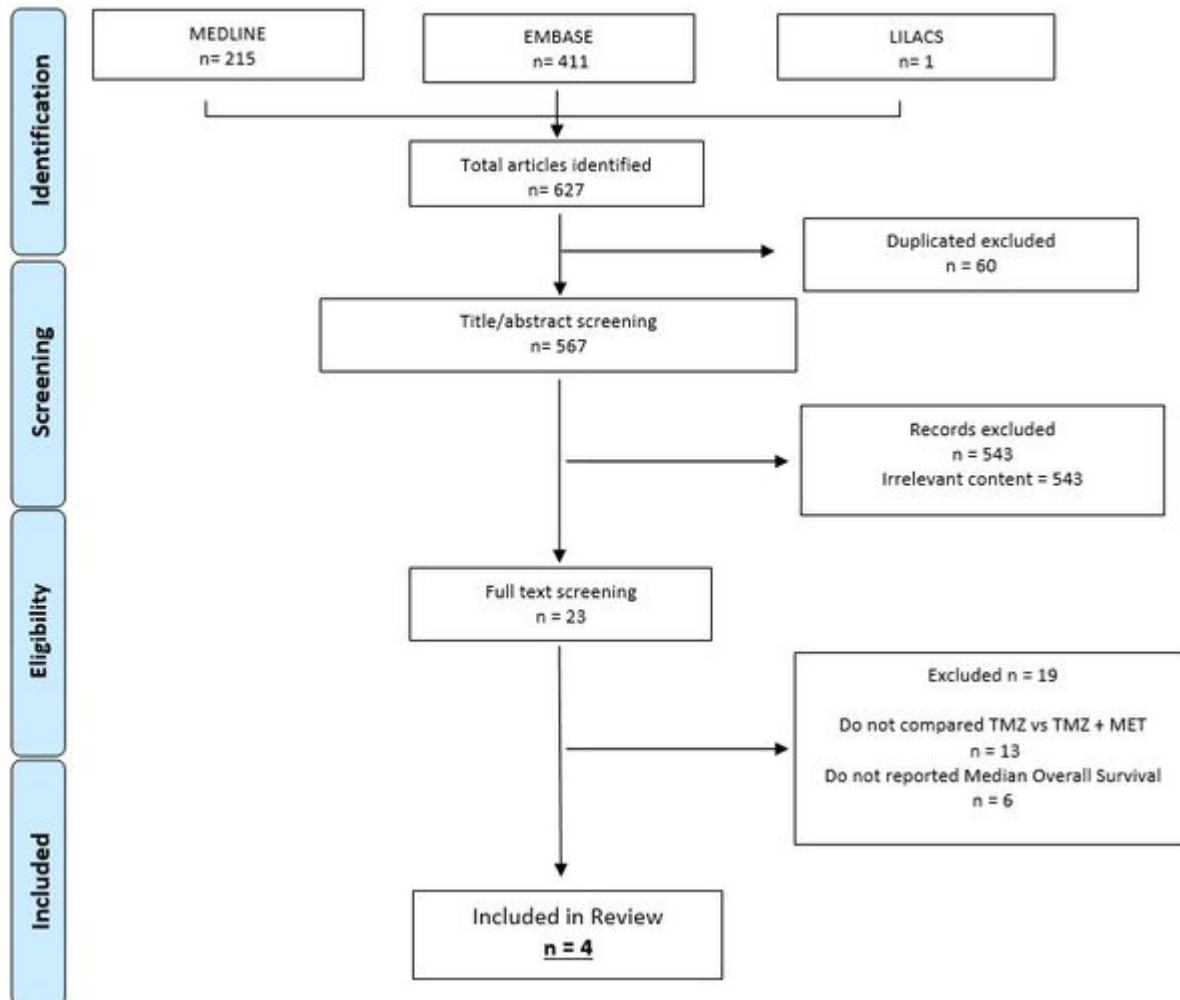
**Objectives:** To evaluate the overall survival in GBM-models treated with TMZ+MET compared to TMZ, or TMZ+BIGUANIDE compared to TMZ through a Systematic Review.

**Background:** The association of Temozolomide (TMZ)+Metformin (MET) is being used clinically, and studies have shown increased survival in patients with Glioblastoma compared to TMZ alone. Preclinical studies have investigated the use of metformin and other biguanides.

**Methods:** This systematic-review adhered to the PRISMA-guidelines and included studies without language or publication date restrictions up until May 29th, 2023, in the MEDLINE, LILACS, and EMBASE databases. Studies were included if they were pre-clinical in-vivo study that compared TMZ vs TMZ+MET or TMZ+Biguanide in GBM-models and reported the Overall Survival. The risk of biases was assessed with SYRCLÉ's. The mean of the Median Overall Survival (OS) was calculated.

**Results:** Four experimental in-vivo studies were included, involving a total of 40 GBM rat models. Among them, 20 (50%) underwent treatment with TMZ+Biguanide, while the other 20 (50%) underwent treatment with TMZ alone. The mean of the Median OS in the TMZ group was 53.8 (SD 8.16) days, while in the TMZ+Biguanide group, it was 80.3 (SD 19.5) days. One of the included studies utilized a specific biguanide called HL156A, while the other three studies used Metformin. Regarding the three studies of TMZ+MET, 30 rat-models were treated. Among them, 15 (50%) underwent treatment with TMZ+MET, while the remaining 15 (50%) underwent treatment with TMZ alone. In this group, the mean of the Median OS in the TMZ group was 52.4 (SD 9) days, while in the TMZ+MET group, it was 71.7 (SD 14.7) days. The SYRCLÉ's bias score resulted in a mean of 2 (SD 0.7).

## PRISMA 2009 Flow Diagram



**Conclusions:** These findings suggest that TMZ+Biguanides or TMZ+MET has superior efficacy to TMZ as a treatment for Glioblastoma in GBM-models.

1498

## Paediatric

ePoster presentation

### Pediatric hydatid cyst of the neck mimicking a cystic tumor: a report of rare case

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**Objectives:** Enhance knowledge about hydatid cyst of the neck.

**Background:** Hydatidosis is a parasitic infection caused by the cestode *Echinococcus granulosus* usually occurring in the liver and lungs. Hydatid cyst of the neck remains rare.

**Methods:** We present a case of six-year-old girl living in the countryside who was admitted to the Department of Neurosurgery with a painless, slowly growing mass located in the neck, evolving for almost two years.

**Results:** A six-year-old girl living in the countryside presented painless, slowly growing mass located in the neck, evolving for almost two years. She was living in a rural area. Physical examination revealed a 4x5cm painless non-tender mass located on the midline of the suboccipital area. The mass was covered with healthy skin, non-reducible with a soft consistency, and non-adherent to the adjacent neck muscles. Abdominal and pulmonary examinations were normal and biological tests were within normal limits.

Cervical (MRI) showed an encapsulated cystic mass with no septations, and no invasion of adjacent tissues and organs. The abdominal ultrasonogram found a solitary asymptomatic hepatic cyst of the right posterior segment measuring 19x17.5x21.2 mm. Chest X-ray and CT scan of the brain were normal, and indirect hemagglutination for hydatid disease was negative. The patient underwent total removal of the cyst under general anesthesia. During the procedure, the characteristic capsule of the cyst was accidentally ruptured releasing a clear water-like fluid. Once the cyst removed, the surgical site was filled with a hypertonic serum to avoid anaphylactic shock following the total removal of the cyst. Post-operative follow-up was uneventful and the patient was immediately started on albendazole. Pathological examination confirmed hydatid cyst.

**Conclusions:** Hydatid cyst of neck is rare, it should be considered in case of slowly evolving cervical mass especially in patient living in rural. Surgery is the main treatment along with albendazole.

1501

## Skull Base

Oral presentation

Artificial intelligence assisted operative anatomy recognition during endoscopic pituitary surgery – a pre-clinical comparative study

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**Objectives:** To develop and validate an artificial intelligence (AI) model capable of assisting in anatomy identification for endoscopic pituitary surgery.

**Background:** Pituitary tumours are located in an anatomically dense region of the body, often distorting surrounding critical neurovascular structures. Identification and protection of these structures intra-operatively can be challenging, often requiring adjuncts (e.g. neuronavigation). Advances in AI may allow its use as a real-time adjunct in anatomy recognition and decision support.

**Methods:** Video recording of 64 operations was undertaken at a tertiary neurosurgical centre using Touch Surgery™ Enterprise, a combined software and hardware solution for securely recording, storing, annotating and analysing surgical videos. Ten images of the sella were extracted from each video and labelled for critical anatomical structures through multi-round expert consensus (Figure 1). An artificial neural network (ANN) was developed and compared with the performance of six novice surgeons on six operative images (unseen by the ANN). The accuracy of sella segmentation by surgeons was assessed with and without AI assistance (using DICE scores).

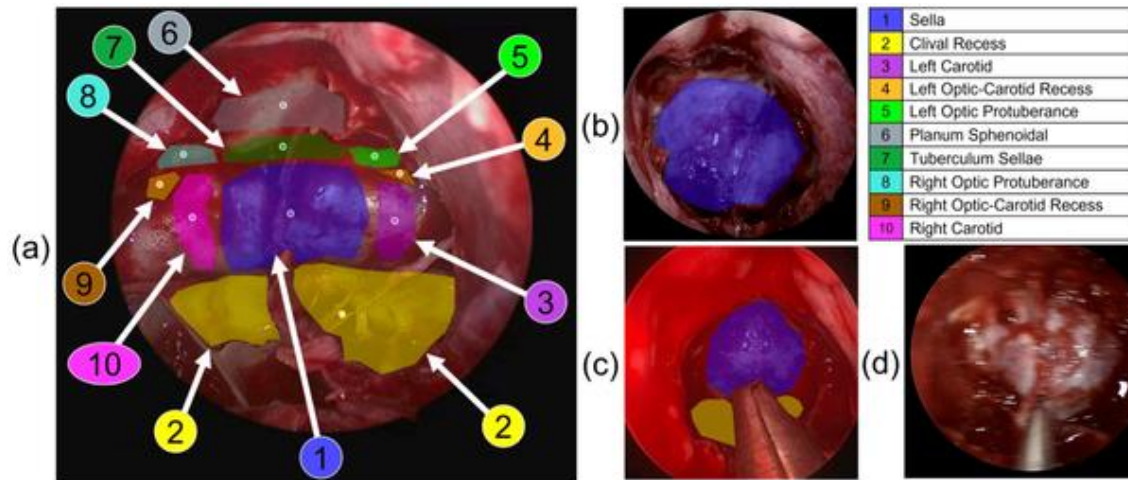


Figure 1: Segmentation masks of the 10 anatomical structures at the sella are displayed with an accompanying legend. The ability to annotate structures varied considerably: (a) an image where all structures are clearly seen; (b) an image where only the sella is visible; (c) an image where some structures are occluded by an instrument and bleeding; and (d) an image where none of the structures are identifiable due to blurriness caused by camera movement. These ground truth annotations were reviewed by multiple consultant pituitary surgeons and used to train an AI model. During the pre-clinical validation study, the DICE coefficient was used to assess the degree of overlap with these ground truth annotations.

**Results:** A 640-image expert-labelled dataset was generated, with the most frequently identified structures being the sella (100%), clival recess (88%), and right optic protuberance (61%). The performance of sella segmentation by the six novice surgeons was 65% DICE, improving to 80% DICE with AI assistance.

**Conclusions:** Our dataset demonstrates anatomy identification in pituitary surgery is challenging, with critical landmarks proving difficult to identify consistently despite expert review, supporting the role of technological adjuncts. Automated identification using AI is possible, particularly for commonly identified structures (e.g. sella). Our early results suggest our ANN improves anatomy recognition by surgeons. Next stages include further validation with senior surgeons and ANN refinements. In the future, these models will be used for education and dovetail with augmented reality to provide real-time surgical decision support.



1502

## Trauma

Oral presentation

Impact of COVID19 pandemic on a cohort of traumatic brain injury patients in the Amazon

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**Objectives:** Evaluate if the pandemic influenced traumatic brain injury patients outcome in the Amazon.

**Background:** Traumatic brain injury (TBI) is a medical and social condition of high worldwide relevance due to its incidence and socioeconomic impact. Specifically, in low and middle-income countries (LMICs), the incidence is higher and its impact is more significant. In the Brazilian Amazon, the capital Manaus seemed to be the epicenter of the pandemic, where the lethality was extraordinarily high and several patients died due to the lack of oxygen in some hospitals. Therefore, it's crucial to understand how this pandemic affected TBI patients during this period.

**Methods:** This is a prospective observational study developed between May 2020 and July 2021 at the only neurotrauma center in the Amazonas State, Brazil. Clinical, laboratory, and tomographic data were collected. The primary outcome was death within 14 days. We divided the pandemic into peak one (from March/2020 and July/2020), peak two, (from Jan/2021 to March/2021), and the whole pandemic with the end after the second peak.

**Results:** 467 patients were included. Of these, 412 (88.22%) were male. Death occurred in 128 patients (27.4%) and of these, 104 (22.26%) died within 24 hours of the trauma. In patients with severe TBI, the case fatality was 71.4%. The most relevant clinical predictors were GCS on admission ( $p < 0.0001$ ), pupillary reactivity ( $p < 0.0001$ ), presence of hypoxia ( $p < 0.0001$ ), or hypotension ( $p < 0.0001$ ). The main tomographic predictors were deviation of midline structures and baseline cistern status. Platelet values and INR were laboratory findings associated with prognosis. Peak one was also associated with death, as well as the whole pandemic. When analyzing the subgroups of TBI patients, the pandemic had an impact most among moderate TBI.

**Conclusions:** Several prognostic factors were identified in this cohort of patients and the COVID-19 pandemic was associated with higher mortality, specially among patients sustaining moderate TBI.

1503

## Global Neurosurgery

Oral presentation

### Neuro oncology services and research capacity in Kenya

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**Objectives:** - Determine the current capacity of neuro oncology services in Kenya  
- To determine current research capacity in neuro-oncology.

**Background:** Cancer is the third leading cause of morbidity in Kenyan population and this has been attributed to lack of awareness, centralized oncology centers and lack of trained health professionals resulting in delayed care. Neuro - oncology services (NOS) in Kenya have significantly improved due to increase in training of neurosurgeons over the last two decades yet little is known on the country's current capacity and challenges.

**Methods:** A 37-item electronic survey was sent to neurosurgical consultants and residents practicing in Kenya. We evaluated availability of neuro -oncology services and research capacity in their workplace.

**Results:** Among 49 respondents (27 consultants, 22 residents; from 19% counties; 51% practice < 5 years), 57% had a significant cranial and spinal tumor workload with >85% having access to CT scan and MRI imaging. Approximately 60% had access to pathology, radiotherapy and chemotherapy services with 96% using a microscope and only 17% having an ultrasonic aspirator. Barriers to practice were: high cost of treatment, delays in referrals between specialties and treatment abandonment. Major Initiatives that improved care were: establishment of multidisciplinary teams and optimization of available resources.

In research, 41% had access to a tumor registry yet only 14% had published in the past year attributing this to lack of funding and protected research time. Having a mentor was perceived as the greatest facilitator for conducting research.

**Conclusions:** This survey has highlighted progress made in neuro-oncology services in Kenya while identifying growth opportunities. 80% of the counties do not have access to neuro -oncology services and research to inform care policy remains largely uncharted. Embedding clinical research in clinical practice through mentorship while engaging stakeholders in the effective ways of decentralizing care can be the growth catalyst for NOS in Kenya

1504

## Paediatric

ePoster presentation

### 100 most cited journal articles in Chiari malformation

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**Objectives:** The focus of this study was to identify the top 100 journal articles specific to Chiari malformation using bibliometric analysis.

**Background:** Chiari malformation represents a common neurological condition frequently encountered with a prevalence of roughly 1 in 1000. From a neurosurgical standpoint, Chiari malformation is one of the most frequently treated conditions in the field. With many publications in the field of neurological surgery, it is difficult to discern which papers are most impactful. Citation analysis allows quantitative data to compare publications.

**Methods:** Using the Journal of Citation Report database, ten journals were identified. The Web of Science Core Collection was then searched using each journal name and the search terms "Chiari malformation, tonsillar herniation, cerebellar herniation." Results were ordered by "Times Cited" and searched by the number of citations. The database contained journal articles from 1976 to 2021, and the following variables were collected for analysis: journal, article type, year of publication, and number of citations. Journal articles were excluded if they had no relation to Chiari malformation, mostly involved basic science research or included animal studies.

**Results:** Ten journals were identified using the above criteria, and a catalog of the 100 most cited publications in Chiari malformation literature was created and analyzed. Articles were arranged from highest to lowest citation number, with further classification by journal, article type, and publication year. Articles were also distinguished by study type and further stratified by etiology. If not specified, studies were instead subcategorized by treatment type.

**Conclusions:** Through our analysis of highly cited publications addressing the different causes, management, and outcomes of patients with Chiari malformation, we hope to demonstrate important trends within the literature. By establishing the 100 most cited Chiari malformation articles we contribute one compilation of journal articles stratified for efficient referencing in hopes of aiding clinicians, researchers, and other potential learners.

1505

## Oncology

ePoster presentation

Rates and patterns of central diabetes insipidus after surgery for sellar and parasellar tumors at the Kenyatta National Hospital, Kenya

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### Objectives:

1. To describe the biodemographic features
2. To determine the proportion of various histologic types of sellar and parasellar pathologies
3. To assess the clinical manifestations and laboratory findings for post operative Central DI
4. To describe the rates and pattern of post operative central DI

**Background:** Central Diabetes Insipidus (DI) is a common post operative complication after procedures for sellar and parasellar tumors. It is associated with increased morbidity, mortality and prolonged hospital stay. It is diagnosed clinically by symptoms of polyuria and polydipsia and measuring serum sodium and osmolality as well as urine osmolality and specific gravity (SG). Limited data exists on rates and patterns of post operative central DI for tumors in this anatomically complex region even with increasing number surgeries being done for these tumors.

**Methods:** This study involved 24 participants following surgery for sellar and parasellar tumors. A descriptive cross-sectional study was used.

**Results:** The mean age of the patients was 28.69 years, 70.8% were female and 29.2% were male. The most common tumor as confirmed by histology was craniopharyngioma seen in 33.3% of the patients. Craniopharyngioma, pilocytic astrocytoma and arachnoid cyst was seen in paediatric age group predominantly while meningioma and pituitary adenoma was more common in adults. 69.2% presented with both polyuria and polydipsia, 30.8% presented with polyuria alone without polydipsia. Following laboratory evaluation, 76.9% of patients who met criteria for diagnosis of central DI had serum sodium levels of 150mmol/L or more at the time of diagnosis and 69.2% of patients with post operative central DI had urine specific gravity of 1.005 or less. Transient and biphasic patterns was seen in 76.9% and 23.1% respectively.

**Conclusions:** The rate of post operative central DI after surgery for sellar and parasellar tumors as seen at KNH was 54.2%. Transient pattern was the most common, seen in 76.9% of the central DI cases.

1506

## Global Neurosurgery

ePoster presentation

Comprehensive health systems policy recommendations for brain tumor surveillance in low and middle-income countries

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**Objectives:** (1) Describe the current landscape of literature surrounding brain tumor surveillance in low and middle-income countries (LMICs). (2) Derive policy recommendations from this body of literature.

**Background:** A robust surveillance system is an important aspect of tumor management, informing tumor etiology, management, and outcomes that ultimately inform resource allocation. Unfortunately, LMICs are more likely to struggle with maintaining such a system due to factors such as inadequate infrastructure. Case studies offer context-dependent insight that may be applicable to similar settings. However, comprehensive health systems policy recommendations for brain tumor surveillance in LMICs have yet to be proposed.

**Methods:** A systematic review of published literature was performed per PRISMA guidelines. Articles discussing brain tumor surveillance in LMICs (World Bank 2023 criteria) were included and subsequently underwent qualitative content analysis.

**Results:** Initial database search yielded 1865 abstracts. After screening, 139 articles with data pertaining to adult (n=6), pediatric (n=54), or both (n=57) patient populations were included in the final analysis. A total of 70 unique LMICs were represented in the final data, with Iran and India boasting the most articles (n=25 and n=22, respectively). From the included articles, relevant information pertaining to brain tumor surveillance in LMICs was summarized; full-text content analysis produced themes that informed policy recommendations. This information was then stratified by the most relevant aspect of health system development, as derived from World Health Organization (WHO) recommendations: service delivery, information management, workforce, infrastructure, financing, and governance.

**Conclusions:** Barriers to establishing brain tumor surveillance systems in LMICs include limited diagnostic abilities, need for data entry personnel, and lack of common data element standardization. This analysis provides a policy recommendation framework for LMICs looking to establish, strengthen, or expand their brain tumor surveillance systems for improved healthcare delivery. Local appropriateness and thus adaptation should be a key guiding principle for implementation of such changes.

1507

## Paediatric

Oral presentation

Central nervous system hydatid disease in a South African paediatric population: a case series

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**Objectives:** To characterize the presentation and management of young children who present with central nervous system (CNS) hydatid disease at Red Cross War Memorial Children's Hospital in Cape Town.

**Background:** CNS Hydatid disease is thought more common in children, and historically the aim is complete removal of a hydatid cyst (without rupture). There is a paucity in international literature on long term outcomes in children with cranial hydatid disease and largely case reports for spinal hydatids.

**Methods:** Retrospective review; children <13 years old diagnosed with CNS hydatid disease. Documented referral region, clinical presentation, associated imaging features, surgical findings (including intra-operative rupture), outcomes and recurrence.

**Results:** There were 21 patients, mostly from rural areas of South Africa's Eastern Cape and one region of the Western Cape provinces. Mean age was 8 years old.

*Cerebral hydatids* (n=16): Patients presented with raised intracranial pressure; mean cyst diameter was 8.1cm; 6 patients had multiple cysts. Intra-operative rupture occurred in nine, controlled aspiration was done in four (missing data in one). All were treated with anti-helminthics. No cases had recurrence, however three patients had index cranial surgery at outside institutions.

*Spinal hydatid disease* (n=5): Patients presented with long tract signs. Two of 5 patients had repeat operations for spinal hydatid, having presented with symptomatic recurrences (paraparesis). Three patients had vertebral involvement; two of whom had later vertebrectomies. Extraspinal hydatid was seen in just under half: seven had concurrent liver disease, two had lung disease, and one had splenic hydatid.

**Conclusions:** CNS hydatid disease disproportionately affects patients from rural areas. This limited case series suggests that controlled aspiration may be acceptable if the cyst is too large for removal *in toto* and may avoid large cortisectomies or intraoperative rupture. Optimal management of vertebral disease is uncertain and clinical dilemmas around spinal hydatid disease will be explored.

1508

## Trauma

Oral presentation

Incidence and clinical outcomes of post traumatic hydrocephalus in a single centre in KwaZulu Natal over one year

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**Objectives:** To assess the incidence of post traumatic hydrocephalus in patients admitted to Inkosi Albert Luthuli and their clinical outcomes following cerebrospinal fluid diversion surgery.

**Background:** Post traumatic hydrocephalus is a known complication in traumatic brain injury, however there are few studies dedicated to the topic.

**Methods:** Data was collected retrospectively from all adult patients above the age of 18 years that had been admitted to the neurosurgical department of Inkosi Albert Luthuli Central Hospital from January 2022 to December 2022. Post traumatic hydrocephalus was defined as ventriculomegaly associated with clinical deterioration requiring cerebrospinal fluid diversion.

**Results:** The total number of patients was 371 and 12 (3.2 %) developed post traumatic hydrocephalus. Of the post traumatic hydrocephalus population the male to female ratio was 11:1. Of the 12 patients, 5 (41%) had undergone decompressive craniectomy. All 12 patients had an external ventricular drain inserted at least once during their admission, but only 4 (33%) ultimately had ventriculoperitoneal shunt insertion, and only 2 (17%) were discharged alive with a functional ventriculoperitoneal shunt, the other 2 were removed due to sepsis. 7 (58%) died and 3 (25%) were discharged back to their referral hospitals for palliation due to poor prognosis.

**Conclusions:** This study highlights the significance of post traumatic hydrocephalus as a complication of traumatic brain injuries and the associated high morbidity and mortality especially with patients who have undergone decompressive craniectomy. However the evidence is limited by the fact that the data was collected from a single centre over a time period of only one year. Larger studies over longer periods need to be conducted for significant evidence on this topic.

1509

## Oncology

ePoster presentation

A radiological- pathological correlation of hyperostosis among patients with intracranial meningiomas at the Kenyatta National Hospital

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**Objectives:** To determine the proportion of patients with radiologic hyperostosis who have microscopic tumor invasion in bone.

**Background:** Meningiomas account for 34.4% of all central nervous system (CNS) neoplasms in Kenya. Hyperostosis has been described in 25% to 44% of meningiomas. According to Simpson et al, complete bony removal is associated with a 9% recurrence rate over a ten year period. Irritation of bony elements by the tumorous growth, activation of osteoblastic cells by neoplastic cells, synthesis of bone fragments by the tumor, and vascular abnormalities brought on by the neoplasm are all factors that may contribute to hyperostosis. The purpose of this study was to ascertain whether radiological changes in skull bones observed in cases of meningiomas are solely attributed to tumor invasion.

**Methods:** This prospective study included all patients with a diagnosis of meningioma with radiological evidence of hyperostosis. Preoperatively, a computed tomography (CT) scan was done by a consultant radiologist and reviewed by two neurosurgeons for associated bony hyperostosis. Intra-op, a sample of the bone measuring 2cm by 2cm by 2cm displaying features of hyperostosis was harvested. Bone samples were decalcified with 10% formic acid. A consultant neuropathologist thereafter microscopically evaluated the samples to check for bone invasion.

**Results:** A total of 36 patients underwent resection for intracranial meningiomas during the study period. Radiological evidence of hyperostosis was present in 22 (61.1%) patients.

The median age of the patients was 45.5 years (range 20-65 years; mean 44.3 ± 11.9 years). Meningothelial meningioma was the most common variant (68.2%). Microscopic tumor invasion of the bone was seen in 13 (59.1%) patients.

**Conclusions:** The findings of this study show that one should remove the bone flap in order to achieve total excision of the tumor, reduce recurrence rates and perform titanium mesh/ hydroxyapatite cement cranioplasty for calvarial reconstruction.



1511

## Global Neurosurgery

Oral presentation

Endoscopic treatment of neurosurgical pathologies: experience and future prospects in the neurosurgery department at Mohammed 6 University Hospital, Marrakech

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**Objectives:** The aim of our study was to demonstrate the major interest of neuro-endoscopy in reducing morbidity and mortality related to the causative neurosurgical pathology.

**Background:** Endoscopic neurosurgery is a surgical technique in which a flexible or rigid video-assisted endoscope is used to introduce light, optical magnification and instruments directly into the surgical field of work. To operate, it is necessary to work in a liquid or aerated cavity.

**Methods:** Retrospective descriptive and analytical study over a period of 11 years from June 2012 to June 2023, on patients recruited and operated on by endoscopic route in the neurosurgery department of the Mohamed VI University Hospital in Marrakech. During this period, 458 patients were treated endoscopically

**Results:** The mean age of the patients was 32 years. Our series included 100 children and 358 adults. The sex ratio was 1.58. Intracranial hypertension syndrome was the most frequent mode of revelation. Hydrocephalus and pituitary adenoma were the most frequently treated pathologies. 250 patients with hydrocephalus were treated by VCS. 140 patients with pituitary adenomas underwent trans-nasal trans-sphenoidal excision. 8 patients with colloid cysts of the V3 underwent coagulation of the cyst wall and its opening, aspiration of its contents, which were whitish and viscous, with saline lavage. For tumours of the pineal region, the procedure consisted of tumour biopsy combined with VCS in all 8 patients. Endoscopic marsupialization of the arachnoid cyst was performed in 4 patients in the series. Endoscopy was also used to complement microsurgery in 12 cases, including 2 meningiomas of the base and 3 endoscopic decompressions of facial neuralgia. Endoscopic lumbar discectomy was performed in 14 cases.

**Conclusions:** Endoscopy is a kind of journey to the centre of the nervous system, from which we bring back images of unusual beauty, and it has earned its place in the neurosurgeon's therapeutic palette.

1512

## Paediatric

Oral presentation

Paediatric hydrocephalus in KwaZulu-Natal, South Africa: lessons learnt in the 21<sup>st</sup> century

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**Objectives:** To evaluate the epidemiology of paediatric hydrocephalus over three, five-year periods in a single neurosurgery unit in the Province of KwaZulu-Natal (KZN), South Africa.

**Background:** Hydrocephalus is one of the commonest neurosurgical pathologies affecting children. KZN has the largest population of children aged 15 and younger in South Africa recorded at 5.4 million.

**Methods:** Data of children treated for hydrocephalus in the periods 2003 to 2007 (group A) , 2008 to 2012 (group B) and 2018 to 2022 (group C), was evaluated, regarding aetiology, treatment and outcomes.

**Results:** A total of 2779 children were treated for hydrocephalus during these periods. The peak period was 2008 to 2012 where 1192 children were treated. Post infectious hydrocephalus (42%) remained the commonest aetiology. Only 78 (3%) children had underlying HIV co-infection over the study period, showing a decreasing trend. VP shunt remained the commonest CSF diversion procedure (85%). Overall shunt complication rate was 18% and in-hospital mortality was 8%, with TB meningitis being predictor of mortality ( $p=0.001$ ).

**Conclusions:** The study highlights the impact of hydrocephalus in a single neurosurgery unit in KZN. Post infectious hydrocephalus remains the key aetiology, highlighting the need for clinicians in high infection prevalence settings to have a high index of suspicion and institute early treatment in order to decrease burden of hydrocephalus.

1513

## Spine

Oral presentation

Neurosurgery out of its borders: inclusive practice of neurosurgery in an orthopedic pediatric team

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**Objectives:** We intend to renew the collaboration between orthopedic and neurosurgical teams for pediatric patients with rare diseases involving spine and spinal cord.

**Background:** Neurosurgery emerged at the end of the nineteenth century thanks to development of anesthesia, innovative tools and techniques. Recent evolution of practice has seen emergences of subspecialties such as pediatric, oncology, functional, leading to multiple units in large neurosurgical departments. Spine surgery has emerged during the last decades and is now shared between neurosurgery and orthopedic teams. We intend to renew the collaboration between orthopedic and neurosurgical teams for pediatric patients with rare diseases involving spine and spinal cord.

**Methods:** After collaborating occasionally for cases and prenatal surgery from another hospital, a pediatric neurosurgeon specialized in spine and spinal cord was welcomed in a conventional pediatric orthopedic department in September 2021. Fields of collaborations has been dictated by the needs of the patients and the national policy for neurosurgical practice.

**Results:** 100 patients have been operated with ortho-neuro collaboration (i.e neurosurgeon and orthopedic surgeon) during the first 18 months. Prenatal surgery, complex spine deformity surgery, spinal cord surgery (dysraphisms), extramedullary oncology and skull isolated lesions have been treated in a pluridisciplinary team including orthopedic surgery, ENT, pediatric surgery, foetal surgery ressources.

Low rate of complications have been encountered (1 complex spine surgery deep infection, 2 CSF leak). No patients needed to be referred to a reference neurosurgical unit.

**Conclusions:** Focusing resources in national care organization is needed to reduce the cost and increase the expertise offered to patients. Building a specialized multidisciplinary team addressing specific technical issues as in rare diseases is an alternative to large specialty units. Building a multidisciplinary team around complex spine and spinal cord disorders at our institution seems to be promising in term of efficient care proposals and safety.

1514

## Trauma

Oral presentation

Neurological assessment of ICP waveform morphology in subjects without neurological complaints

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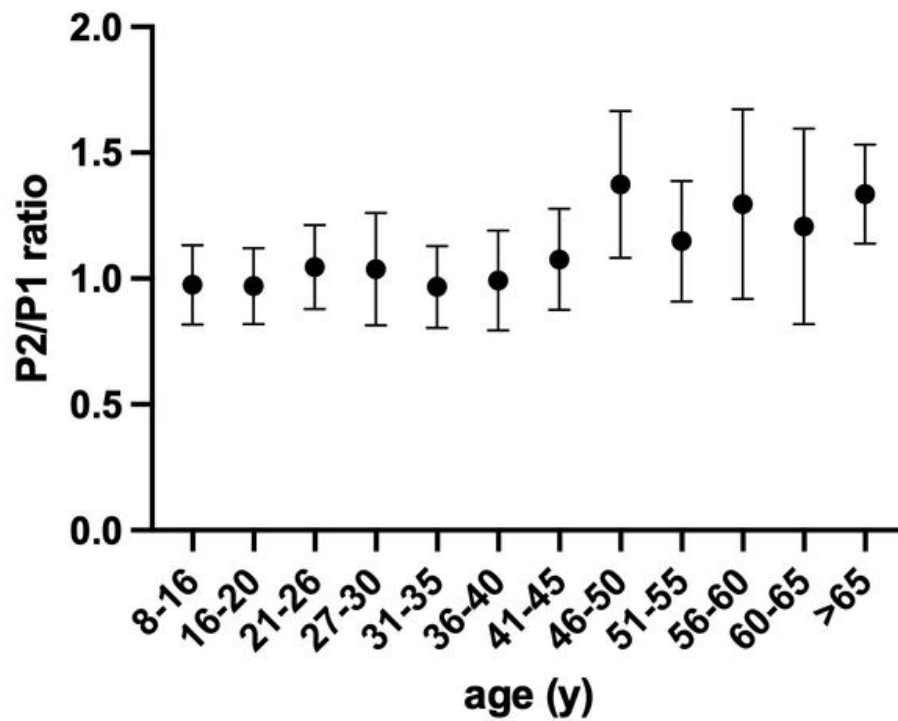
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**Objectives:** To determine reference values obtained from the pulse wave analysis of intracranial pressure using a non-invasive system in participants without neurological complaints.

**Background:** The evaluation of the intracranial pressure waveform morphology indirectly indicates brain compliance. The Brain4care device allows the assessment of this morphology in a non-invasive way using a sensor next to the scalp that "captures" the elasticity of the skull. This technology has allowed a more in-depth study of several neurological and non-neurological conditions that can impair brain compliance. However, no study has evaluated this device in a population cohort without neurological complaints.

**Methods:** This is an analytical and cross-sectional study carried out in a tertiary center approved by the Ethics and Research Commission of the Federal University of Amazonas. Inclusion criteria were individuals without neurological complaints and over two years of age. The following variables were analyzed based on the ICP pulse waves: P2/P1 ratio, Time to peak, and wave amplitude.

**Results:** A total of 120 individuals were evaluated; 65 (54.1%) were female. The mean age was 39.5 years  $\pm$  17.7, with a median of 37.5 years (p25=24, p75=53). The minimum age was eight years, and the maximum age was 83.



48 (40%) participants were overweight. The reference curve is shown in Figure 1. The mean P2/P1 ratio at 0 and 45 degrees was 1.11  $\pm$  0.27 and 1.11  $\pm$  0.26, respectively. The time-to-peak at 0 and 45 degrees was 0.20  $\pm$  0.09 and 0.19s  $\pm$  0.08. The mean pulse amplitude at 0 and 45 degrees was 8.08  $\pm$  5.5 and 7.5  $\pm$  5.1.

**Conclusions:** This study established reference values parameters for a non-invasive method for assessing brain compliance in different age groups.

1515

## Education, Ethics, Socioeconomic

Oral presentation

Obstetrical outcome in patients with dysraphism: interest of an enlightened neurosurgical advice through new Orphanet spinal dysraphisms classification

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**Objectives:** Our study aims to identify the specific obstetrical and postpartum complications in patients with open or closed dysraphism.

**Background:** For the last twenty years, the number of patients with dysraphism who achieve pregnancy has been increasing. The lack of recommendations for the obstetrical care of these patients complicates their management.

**Methods:** Retrospective descriptive multicenter study. All pregnant patients with closed dysraphism or open dysraphism who delivered at least at 22 weeks between January 1, 2006, and December 31, 2021, were included. All data concerning the pregnancy and potential complications of the pregnancy on dysraphism symptoms up to 3 months after delivery were collected by reviewing each patient's record.

**Results:** 50 pregnancies in 29 patients with closed dysraphism and 30 pregnancies in 20 patients with open dysraphism were included.

In patients with closed dysraphism, the most frequent complication was lower urinary tract infection. Of these patients, 22/51 live births were delivered vaginally.

In patients with open dysraphism, the most frequent complications were lower and upper urinary tract infections, gestational diabetes and suspicion of preterm labor. 27% of patients had gestational diabetes and 23% were hospitalized for suspicion of preterm labor. 28/30 live births were by cesarean deliveries, with 27 of which performed under general anesthesia, and 4 cesareans were complicated (hemorrhage, digestive or bladder injury). Reassessment of dysraphism diagnosis through new orphanet classification has modified a third of the diagnosis.

**Conclusions:** Patients with an open or closed dysraphism have, overall, a favorable obstetrical prognosis. In case of open dysraphism, the risk of obstetrical complication is important (urinary tract infection, gestational diabetes, suspicion of preterm delivery) and a close multidisciplinary follow-up is necessary to limit this risk. Actual reassessment of diagnosis of spinal dysraphisms in pregnancies cases would change the adaptation of care initially due unprecised Spina Bifida status.

1516

## Oncology

ePoster presentation

### Endoscopic pituitary surgery: a single centre experience in Kenya

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**Objectives:** Endonasal surgery is now well established in management of sella lesions. We are amongst the early adopters of the same technique in our region and report our early experience in the same.

**Background:** Pituitary adenomas present late in our context with relatively larger tumours and visual disturbance. For a long time sella cases were managed transcranially but the adoption of microscopic and subsequently endoscopic techniques have resulted in most cases now being done endonasally. We set up a service that includes ophthalmologists, endocrinologists and ENT surgeons for this group of patients. Intra-operative adjuncts like neuronavigation have also been introduced and are now routine. This is our report of our experience so far.

**Methods:** Retrospective review of our theatre log from 2014-2022 of all endoscopic endonasal pituitary surgeries. Imaging was reviewed for Knosp and Hardy pre-operative scoring. Pre and post-op endocrine status and visual outcomes.

**Results:** 25 cases were identified with a mean age of 46.7years (22-79years). There were 14 males. Only one case had elevated prolactin levels with the rest being non functional. Pre-op imaging was available on our PACS for 16 patients with 9(56.2%) having a Hardy Score  $\geq$  4C and 12 (75%) having a Knosp score  $\geq$  3A. Loss of vision and headache were the predominant presenting complaints. Use of the nasoseptal flap was standard in all cases. Hypoadrenalism was present in 8/15 (53.3%) cases pre-operatively and 12/17 (70.6%) post-operatively. DI was reported in only 1 case.

**Conclusions:** Our series shows good outcomes with endonasal approach with good endocrine outcomes that were well investigated and managed. Our next step is development of a service for functional pituitary adenomas. Electronic data was incomplete but the recent introduction of an integrated electronic health record system in our institution will address this in future studies.

1517

## Global Neurosurgery

ePoster presentation

### Management of hydatidosis of the central nervous system

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**Objectives:** Analysis of the current epidemiology of hydatidosis of the central nervous system, as well as the possible factors affecting the management of these cases.

**Background:** It is a public health problem in Morocco, and the impairment of the CSN is often primitive and rare, it concerns two entities: Cerebral hydatidosis and vertebro-medullary hydatidosis, the diagnosis is mainly based on imaging and the treatment is basically surgical.

**Methods:** retrospective study over a period of 10 years (between January 2013 and December 2023), about 46 cases of CNS hydatidosis assembled in our Neurosurgery department. we used the exploitable files of the patients hospitalized and treated in the neurosurgery department.

**Results:** the frequency of BHC was 65% versus 35% of vertebro-medullary involvement. With ages between 7 and 15 years, for the brain localization; and of more than 22 years. for the VMHC, we noted a clear male predominance with a percentage of 65.2%, The rural origin is found in 80.4% of cases. Contact with dogs was found in 26 patients of rural origin and one person of urban origin. The clinical presentation of BHC is predominated by high ICH, which is found in all patients. For the VMHC, the majority of patients consulted for motor, sensory and sphincter disorders. CT-scan was performed in 30 patients. The seat of predilection is the parietal lobe. All patients received surgical cure. The immediate postoperative evolution was good, meanwhile the late evolution was marked by blindness in 3 patients, facial paralysis in a patient a diplopia in a patient. One death was reported by rupture of the hydatid cyst, two cases of recurrence were observed at 1 year and 5 years.

**Conclusions:** Prevention is the best way to avoid disease through the adoption of health education program and also fighting all the factors transmitting the parasite in order to eradicate it.



1521

## Global Neurosurgery

ePoster presentation

Spectrum of chronic subdural haematoma in elderly patients managed at a single neurosurgical centre

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**Objectives:** To determine the spectrum, demographic patterns, risk factors, clinical presentation, imaging patterns, surgical management and outcomes of surgical management of chronic subdural haematoma.

**Background:** Chronic subdural haematoma (CSDH) is an encapsulated collection of blood, mostly liquefied and located between the dura mater and arachnoid. The clinical presentation is variable and may include behavioural changes, altered level of consciousness, headache, hemiparesis, cognitive disturbances, seizures, faecal and/or urinary incontinence. Computed tomography of the brain remains the most important diagnostic test.

**Methods:** We conducted a retrospective analysis of elderly patients diagnosed with CSDH undergoing surgical treatment from January 2016 to September 2022. We analyzed: age, duration of symptoms to diagnostic imaging, pre and post-operative GCS, type of surgery, associated co-morbidities, use of postoperative drainage and outcomes

**Results:** The sample consisted of 135 elderly patients, 81 (60%) male and 54 (40%) female patients (ratio 1.5 : 1), ages ranged between 65-90 years, with an average of 72,6 years. Fifty eight percent of our patients had non-traumatic CSDH, with the duration of symptoms averaging 14.4 days. There were 134 patients (99%) with a headache, 102 (76%) were hypertensive and had a focal neurological deficit. Altered level of consciousness was present in 121 (90%) of patients and motor abnormalities in 76 %. The CSDH was located on the right in 43%, left in 30% and bilaterally in 27% of patients. Two burrhole craniostomies were performed in 83 (61%) and one in 52 (39%) of patient and had a closed drainage system. We had a complication rate of 7%, recurrence and had a mortality rate of 4% respectively.

**Conclusions:** The change of the level of consciousness was the common clinical alteration and headache, the most common symptom. The most associated co-morbidity was hypertension. The burrhole craniostomy with a closed drainage system was operation performed, with high efficacy and low complication rate.

1522

## Endovascular Neurosurgery

ePoster presentation

Coexistence of posterior cranial fossa dural arteriovenous fistula (DAVF) and middle fossa arteriovenous malformation (AVM) with a common drainer

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**Objectives:** Author of case report aims to emphasize possibility of coexisting presence of cerebrovascular malformations. Especially in presence of shared drainage system, treatment of each malformation may affect course of other malformation.

**Background:** Intracranial dural arteriovenous fistulas (DAVFs) and arteriovenous malformations (AVMs) are relatively rare lesions. Concomitant presence of these two malformation is quite rare.

**Methods:** This is case report about detailed history and follow-up of a case with recurring hemorrhage of middle cranial fossa (MCF) AVM after embolization of posterior cranial fossa (PCF) DAVF which share a connected drainage through vein of Labbe.

**Results:** Patient is presenting with loss of consciousness, left-sided intracerebral hemorrhage is found in CT and temporoinular AVM in MRI. There is no sign of herniation and no regression in Glasgow coma score (GCS) so no decompression is planned. Patient is taken to ICU for follow-up. Investigation of online medical records is obtained with an embolization history in another clinic (2,5 years ago) for DAVF on sagittal sinus, both transverse sinus and confluence which is Borden type II. He had recurring admittance in different outpatient clinics for headache for 2,5 years before embolization. During time of embolization, presence of a MCF AVM on temporal lobe with nidus size of 1,5 cm is noted. Angiography reports present with total occlusion of right internal carotid artery (ICA) and collateral flow of right side from left ICA through AComm, which is probably the reason for not to treat AVM. After embolization, patient had recurring hemorrhages on that AVM nidus and in last admittance AVM nidus size is increased to 3 cm. During follow-up in ICU, his GCS is improved from 12 to 14 and patient is discharged after 2 weeks to another clinic for GammaKnife radiosurgery of AVM.

**Conclusions:** Neurosurgeons should be aware of the coexistence of DAVF and AVM which sharing same drainage system. Only simple occlusion of the drainer from DAVF may not be sufficient, and even may cause worse results than expected.

1523

## Spine

Oral presentation

Short-segment posterior fixation with pedicle screws at the level of the fracture (Short Same-Segment Fixation - SSSF) for unstable thoracolumbar fractures

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**Objectives:** Primary objective of this study was to evaluate the efficacy of SSSF in the treatment of unstable Thoraco-Lumbar Fractures (TLF) and the secondary objective was to study any difference in outcome whether single pedicle versus both pedicles included for fixation at the fractured level.

**Background:** SSSF considered to have biomechanically stronger fixations with good correction of kyphotic deformity and reduced failure rates.

**Methods:** Retrospective analysis of 81 patients over 4 years who underwent SSSF for unstable TLF and completed follow up for at least 12 months were included. Radiological evaluation with Cobb angle, functional outcome with ODI and VAS for pain were evaluated as primary outcome measures and intra-operative blood loss, length of hospital-stay, post-op complications were assessed as secondary outcomes.

**Results:** Study included 64 males and 17 females.

36 patients had single pedicle screw(SP) inserted at the injury level and 45 patients had both pedicles fixed(BP) at the index level.

Mean hospital stay was 5.12 days.

Mean kyphosis correction at immediate post op was 10.298( $p < 0.001$ ).

Mean kyphosis correction at 12 months follow up was 5.43( $p < 0.001$ ).

Mean loss of kyphosis correction at 12 months was 4.83.

There was a significant difference in VAS scores and ODI scores between pre-op and follow up values at 1, 6 and 12 months( $p < 0.001$ ).

No difference in VAS,ODI scores, hospital stay, blood loss, operative time, time before ambulation noted between SP and BP groups. BP group showed significantly higher kyphosis correction at immediate post-op period. No significant difference between the groups for other Kyphotic Angle parameters noted.

Number of failures at 12 months were 4,with 2 Pseudoarthrosis and 2 hardware failures(screw pull out).

**Conclusions:** SSSF shows improved pain scores and functional outcome but there is significant loss of kyphosis correction over time. No significant difference in outcome whether one pedicle or both pedicles were included at the fractured level.

1525

## Hydrocephalus

ePoster presentation

A rare case of racemose neurocoenurosis caused by taenia serialis in a child

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**Objectives:** - Confirm that T.serialis infection just like T.multiceps can cause CNS coenurosis.  
- Establish that CNS coenurosis can present as parenchymal and extra parenchymal lesions that can be designated as racemose neurocoenurosis.

**Background:** Human neurocoenurosis has been reported to be caused by T. multiceps mainly. Only 2 cases of neurocoenurosis caused by T.serialis have been reported in the literature. In 2020 the first case of CNS coenurosis caused by T serialis was reported in a patient with a single lesion in the occipital lobe. In 2022, a 2nd case was reported in a patient with disseminated subarachnoid coenurosis, mimicking the well-known cysticercosis racemosus. We are presenting the 2nd case of disseminated subarachnoid coenurosis.

**Methods: Clinical case:** 4 years old male who presented with acute hydrocephalus and previous 3 episodes of meningitis. A presumed diagnosis of post bacterial meningitis hydrocephalus was made and a VP shunt was placed. He subsequently had multiple shunt revisions and long antibiotic courses. An ETV was then attempted: multiple cysts were found in both lateral ventricles and basal cisterns, and were removed. Diagnosis of racemose neurocysticercosis was made and the patient was started on prednisone 1mg/kg, praziquantel 75mg/kg/day, albendazole 15mg/kg/day. Day 1 post op MRI showed significant residual cysts and a non-patent stoma. Patient had a repeat endoscopic removal of the cysts with satisfactory post op MRI. The patient improved clinically and was discharged home after VPS placement. Histopathology specimen revealed cystic parasitic membranes with chitinous mouth parts. PCR CSF analysis showed that the disease was coenurosis caused by T.serialis.

**Results:** T serialis infection can cause neurocoenurosis in 2 forms: parenchymal and extra parenchymal lesions.

**Conclusions:** This case confirms that T. serialis infection can cause CNS coenurosis in 2 forms: parenchymal and extra parenchymal lesions that can be designated as racemose neurocoenurosis. It adds to the differential diagnosis for racemose neurocysticercosis in human.

## Hydrocephalus

Oral presentation

Optic nerve sheath diameter measurement with ultrasound in outpatient clinics: a practical non-invasive tool for treatment decisions

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**Objectives:** 1) Measure the Optic Nerve Sheath Diameter (ONSD) of candidates to surgical procedures for the treatment of hydrocephalus.

2) Correlate this measurement with clinical and ophthalmological findings to choose the best option.

**Background:** Ultrasound measurement of ONSD has become an increasingly popular non-invasive method for assessing intracranial pressure (ICP) in outpatient clinics. Hydrocephalus may be a complex condition with different treatment options. Sometimes, symptoms in outpatients can be subtle and Magnetic Resonance Imaging (MRI) is not enough to achieve a complete understanding of the ICP status.

**Methods:** We performed the measurement of the ONSD of patients with MRI compatible with hydrocephalus, but with little expressive symptoms. Clinically, the patients had little or no headache and visual complaints that could be attributed to other causes (presbyopia and ocular trauma). MRI showed pervious aqueduct with CSF flow and mild enlargement of the ventricular system without signs of CSF transudation. Findings were confirmed by ophthalmologic fundoscopy.

**Results:** First patient was a F 40 yo, who started with mild headaches and blurred vision 9 months after a Third Ventricle Endoscopy for Hydrocephalus caused by Neurocysticercosis. MRI showed moderate enlargement of ventricles and no fluid transudation. The average ONSD was 6,5 mm, she had papilledema and retinal bleeding which strongly suggested raised ICP. A Ventriculoperitoneal Shunt was indicated. Second patient was a F 60 yo who suffered brain trauma 6 months before and presented gait changes, visual complaints, and urinary incontinence. The MRI also showed enlargement of ventricles without signs of CSF transudation. The average ONSD was 4,3 mm without papilledema. In that case, surgery was not indicated and different etiologies for the symptoms were identified.

**Conclusions:** ONSD measurement was helpful and determinant in both cases. Point-of-care ultrasound is strongly advised in the modern neurosurgery outpatient clinics.

1528

## Global Neurosurgery

ePoster presentation

Intraoperative ultrasound (IOUS) guided drainage of brain invasive aspergillosis abscess of an immunocompetent patient

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**Objectives:** Case report of a rare case of brain Invasive Aspergillosis in an immunocompetent patient. IOUS was used to guide the abscess drainage.

**Background:** Central nervous system (CNS) infections by Aspergillus spp and other filamentous fungi are rare conditions with poor prognosis. CNS invasion result of hematogenous spread among immunocompromised patients by local extension or direct inoculation secondary to trauma in immunocompetent patients. IOUS is the only real-time exam that can be used intraoperatively on drainage of abscesses.

**Methods:** Literature review on cases of immunocompetent patients with cerebral invasive Aspergillosis and on drainage of brain abscesses guided by IOUS.

**Results:** 71 yo F, hypertensive, with cardiac arrhythmia, was intubated in ICU for weeks due to severe covid-19. After being discharged, she noticed anosmia and headache, but it was considered covid-related. Four months later she had same level fall with traumatic brain injury. The skull CT reported a frontal contusion. As symptoms progressed in intensity, an Angio-MRI of the skull was performed and identified a lesion suggestive of an aggressive tumor (esthesioneuroblastoma). Serologies for hepatitis B, C, HIV and syphilis were negative. New skull MRI identified brain abscess weeks later. Microneurosurgery for resection was significantly improved with IOUS. Anatomopathological examination: filamentous fungal structures (hyphae) with acute septation consistent with Aspergillus sp. Grocott and PAS special stains showed fungi. Treatment with amphotericin B deoxycholate was started but worsening of renal function and hydroelectrolytic disturbances, forced us to switch to oral voriconazole during hospitalization and outpatient follow-up. She had significant improvement but failed to adhere to treatment. There was recurrence of the lesion with successful reoperation, and she is still being followed up by neurosurgeons and infectologists.

**Conclusions:** CNS invasive Aspergillosis are extremely rare in immunocompetent patients, but this diagnose must be considered. IOUS can be extremely helpful on drainage of abscesses and its use is advised.

1529

## Paediatric

ePoster presentation

Deep frontal lipoma mimicking a frontal encephalocele: report of a rare case

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**Objectives:** Emphasize forehead lipomas' clinical and surgical characteristics.

**Background:** Lipomas are benign masses of fatty tissue, and in the forehead, they may develop in the subcutaneous or deep fat tissue. While subcutaneous lipomas are common, deep forehead lipomas are unusual and rarely invade the underlying bone.

**Methods:** Case report and literature review.

**Results:** We present a case of a slowly growing frontal mass corresponding to a deep lipoma responsible for frontal bone invasion, resulting in a bony defect reaching the dural space.

**Conclusions:** Although deep forehead lipomas are uncommon, physicians must be familiar with them. The lesions may fade with time, but they may also be accompanied by esthetic problems and functional complications such as vision impairment and pain.

1531

## Global Neurosurgery

Oral presentation

The profile of children with severe traumatic brain injury at Red Cross War Memorial Children's Hospital, Cape Town

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**Objectives:** We aimed to

1) identify risk factors associated with severe TBI to establish preventative strategies and improve clinical care, and  
2) characterize the common surgical interventions in this cohort.

**Background:** There are more fatalities due to trauma-related deaths than TB, HIV and malaria combined. In children, the most trauma-related deaths and survivor disabilities are due to traumatic brain injury (TBI). Despite this burden, quantitative data from low- and middle income countries (LMIC) is lacking. These data are important for informing targeted public health campaigns and improving clinical services.

**Methods:** Data were collected retrospectively for children  $\leq 12$  with severe TBI (intubated and ventilated) between 2006 and 2021. Data were analysed using the software program R and the user interface RStudio.

**Results:** There were 745 children in the cohort. Nearly two-thirds were male (64.7%), and road traffic accidents (RTA) were the commonest cause of injury (78%). Non-accidental injuries (NAI) and gunshot wounds accounted for 4.3% and 4.1% respectively. The average time from injury to admission was 4.8 hours, to CT scan was 7.3 hours, and to ICU admission was 13.1 hours. 508 (68.2%) underwent intracranial pressure monitoring +/- brain tissue monitoring; 71 underwent decompressive craniectomies; 57 had tracheostomies performed. Almost half of the cohort (48%) underwent surgery other than intracranial monitor insertion.

**Conclusions:** This is a large, well-characterised dataset of young children with severe TBI in a LMIC setting. From a community perspective, behavioural risk factors should be addressed, especially targeting males and RTAs. The high rate of intracranial monitoring and surgeries in general highlight the need in these patients as well as capacity for an overall aggressive approach in a LMIC environment. However, duration of prehospital care and disposition in-hospital prior to ICU admission remain suboptimal and needs targeted intervention.



## Neurovascular Surgery

ePoster presentation

### Therapeutic management of brainstem cavernoma in elderly individuals

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**Objectives:** Therapeutic approach for brainstem cavernomas in elderly patients.

**Background:** Cavernomas are rare vascular malformations that affect the brain and spinal cord, representing 5% to 10% of cases. However, their occurrence in the brainstem is uncommon. There are no clear guidelines regarding the removal of symptomatic cavernomas in the brainstem of elderly patients.

**Methods:** Literature review and description of two cases of cerebral cavernoma from a referral center in the metropolitan region of Curitiba. Cavernomas are rare vascular malformations that affect the brain and spinal cord, representing 5% to 10% of cases. However, their occurrence in the brainstem is uncommon. There are no clear guidelines regarding the removal of symptomatic cavernomas in the brainstem of elderly patients.

**Results:** The clinical presentation of cavernomas may include seizures, headaches, neurological deficits, and hemorrhages. In the specific case of cavernomas in the brainstem of elderly individuals, the challenge lies mainly in accessing the affected region. Previous studies indicate that a conservative approach tends to be favorable in this age group. However, there have been reported cases of bleeding or neurological deficits, which justify surgical intervention. In our service, two female patients, aged 68 and 74 years, were diagnosed with cavernomas. The first patient presented with progressive cognitive decline, language impairment and executive abilities. The second patient initially experienced hearing loss in the right ear, confusion, and convergent strabismus. Unfortunately, the second patient passed away during hospitalization. Conservative treatment was opted for both patients, considering the location of the cavernomas in the brainstem.

**Conclusions:** The therapeutic management of cavernomas in elderly individuals, especially in the brainstem, requires individualized evaluation. Further studies are needed to provide more precise guidelines. Currently, the literature suggests imaging follow-up for asymptomatic cases, along with careful assessment of the risk-benefit ratio of surgery in the presence of symptoms and the risk of bleeding.

1535

## Global Neurosurgery

ePoster presentation

Intracranial hematoma after ventriculoperitoneal shunt placement in a patient with factor V deficiency: a rare case report

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**Objectives:** Enhance knowledge about peri operative management of factor V deficiency.

**Background:** Congenital factor V deficiency (FVD) is a rare bleeding disorder. So far, there are no standard protocols for pre- and peri-operative management of patients with factor V deficiency.

**Methods:** We present a 60-year-old woman with factor V deficiency admitted to the neurosurgery department of Ibn Tofail Hospital for hydrocephalus requiring a ventriculoperitoneal shunt. Pre-operative management of the patients as well as outcome and follow-up are described and compared with literature.

**Results:** The patient, a 60-year-old woman with family history of FVD, presented headache, double vision, nausea, vomiting, and dizziness evolving for several weeks. examination showed cerebellar syndrome. MRI showed large compressive mass of left cerebellar pontine angle compatible with Meningioma and hydrocephalus.

Biological tests showed hemoglobin and platelet rates within normal limits. Prothrombin level was 38%, international normalized ratio (INR) was at 1.5, and factor V level was at 12%. surgery of the intracranial process was deemed of high bleeding risk and could be life-threatening. We decide that the placement of a VP shunt at this stage would be less risky and sufficient to improve patient's complaints.

Prior to surgery, the patient received a bolus of 1100 ml of FFP. The control prothrombin level was 65% (INR 1.5), and factor V recovered to 25%.

The patient underwent a VP shunt placement. She woke up normally and admitted to intensive care unit for a 24-hour. On the second postoperative day, she presented intense headaches and vomiting with preserved consciousness and a normal neurological examination. CT scan demonstrated massive intra-cranial temporoparietal hematoma located in the trajectory of the VP shunt intracranial catheter. The patient was closely monitored for any significant change in consciousness levels along with symptomatic treatment. Good evolution of outcome.

**Conclusions:** Further studies of FVD are required to standardize peri operative management.

## Paediatric

Oral presentation

### Determining the clinical relevance of traumatic retroclival hematoma in children

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**Objectives:** To characterize the features and management of traumatic retroclival epidural hematoma (TRcH) in children at the Red Cross War Memorial Children's Hospital, Cape Town.

**Background:** TRcH is known to be more common in children than adults and is easily missed. Due to only case reports and small case series being reported, the clinical importance, especially as an indicator of possible craniocervical instability (CCI), is unclear in paediatric traumatic brain injury (TBI).

**Methods:** Retrospective review. Children ( $\leq 13$  years old) with TRcH diagnosed on head CT scan post-TBI with subsequent MRI of the cervical spine were identified. Clinical variables, management and outcome were recorded.

**Results:** 38 patients with TRcH diagnosed on initial brain CT scan post-trauma had subsequent MRI evaluation. The mean age at diagnosis was 6,7 years. The mechanism of injury was road traffic accident-related in 30 patients, falls in 7 cases, and non-accidental injury in 1. There were 14 patients who had ligamentous injuries diagnosed. Of these, three patients had increased C1-C2 interspinous distance and underwent cranio-cervical fusion. Each of these were suspected on Lodox X-ray and head CT prior to MRI. Eleven patients had associated cervical spine ligamentous injuries that were treated conservatively and fully recovered. One patient developed delayed post-traumatic hydrocephalus and a syrinx. In no case was the haematoma evacuated.

**Conclusions:** To date, this is the largest case series of TRcH children to evaluate both CT and MRI imaging findings. The minority of patients had CCI, and this was suspected prior to MRI. Just over a quarter of patients had ligamentous injuries without bony abnormalities and these were treated conservatively. Caution should be exercised when a TRcH is evident. To diagnose the haematoma the lowermost cuts should include the CCJ and be specifically examined for TRcH.

1537

## Paediatric

Oral presentation

Describing the characteristics of craniocerebral gunshot wounds and associations with intracranial pressure and brain tissue oxygenation in young children

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**Objectives:** The authors aim to describe the characteristics of young children with TBI due to GSWs with a focus on intracranial pathophysiology.

**Background:** Craniocerebral gunshot wounds (GSWs) are a potentially lethal form of penetrating traumatic brain injury (TBI). There is a paucity of literature detailing pathophysiological sequelae in children.

**Methods:** Retrospective review of cranial GSWs in children <13 years old managed at Red Cross Childrens War Memorial Hospital, Cape Town over a 16 year period. We examined clinical and radiological factors, as well as high frequency intracranial pressure (ICP) and brain tissue oxygenation (PbtO<sub>2</sub>) data.

**Results:** There were 65 patients with cranial injury, 38 of whom had intracranial penetration. Median age was 6 years and 7 patients died. None were related to suicide. 16 patients had high frequency ICP and PbtO<sub>2</sub> data. The overall median ICP was 14,76mmHg (IQ:12,3; 16,71) and 75% of patients had periods of prolonged intracranial hypertension where ICP was >20 mmHg for >1hour. Four patients had at least one period of prolonged critical cerebral hypoxia (PbtO<sub>2</sub><10 mmHg for >1hour); these patients also had ICH, and two of them patients died. Patients with a maximal intracranial bullet trajectory less than 9cm had a median ICP of 14mmHg; 6 patients had ICH, 1 patient had ICH and critical cerebral hypoxemia. In contrast, patients with a maximal intracranial bullet trajectory >9cm had a median ICP of 16mmHg, all 6 patients had ICH, 50% had ICH and critical cerebral hypoxia. No other imaging pattern associated with outcome.

**Conclusions:** The described cohort is younger than in most of the literature. Longer intracranial trajectories associated with more disrupted intracranial physiology. ICH was common; prolonged cerebral hypoxia was less common, but half of these patients died.

1538

## Paediatric

Oral presentation

### Experience in mono and multisutural craniosynostosis with minimal invasive technique

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**Objectives:** Determine the usefulness and safety of minimally invasive techniques for the treatment of uni or multisutural craniosynostosis supported by craniometry index.

**Background:** Various techniques have been described for the treatment of craniosynostosis, depending, among other things, on the type of craniosynostosis, number of sutures affected, the age of the patient, associated diseases such as hydrocephalus, and preference of the surgical team. We evaluated the surgical outcome employing techniques of minimal invasive suturectomy. The use of postoperative cranial orthosis still remains controversial.

**Methods:** Patients who underwent an operation for craniosynostosis in our hospitals from 2014 to 2022 were reviewed. For qualitative analysis of the surgical outcome, we analyze the morphological characteristics based on the use of clinical photographs and tomography. All parents with children with craniosynostosis were offered between two surgical treatment alternatives, open and the minimally invasive technique.

**Results:** Of 216 patients with craniosynostosis 61 patients were operated with minimally invasive technique. Five patients with multisutural nonsyndromic craniosynostosis and 56 children with non-syndromic monosutural craniosynostosis. 10 patients with posterior plagiocephaly, 38 with scaphocephaly, five with anterior plagiocephaly and three with trigonocephaly.

In some patients we found discrete bulges mainly in the frontal region, minimal changes in the orbits and slight deviation of the nasal pyramid, the latter in which a coronal suture was affected, despite this without visual and neuropsychological compromise until the current follow-up of the cases.

The age at which patients were operated on was between 3 and 6 months.

In six patients we used a cranial orthosis postoperatively.

All patients operated on using minimally invasive technique during follow-up had a normal cephalic index.

**Conclusions:** Nonsyndromic, mono or multi-suture synostosis minimal invasive suturectomy resulted in favorable outcomes, although use of postoperative cranial orthosis could improve the correction it was not decisive for the final result either.

1539

## Endovascular Neurosurgery

ePoster presentation

Pseudoaneurysm of the posterior circulation as an uncommon cause of subarachnoid hemorrhage: a traumatic case report

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**Objectives:** To report a case of traumatic pseudoaneurysm of the posterior circulation.

**Background:** A 65-year-old female patient was admitted with a history of headache and decreased level of consciousness, which started 3 days after falling from the bed. The Glasgow Coma Scale was 13, the Hunt-Hess score was 2, and the cranial tomography showed a subarachnoid hemorrhage (SAH) with a Fisher scale score of 3. Angiography revealed a wide-neck pseudoaneurysm (6mm) in the P1 segment of the right posterior cerebral artery, which was treated with endovascular occlusion of the aneurysm.

**Methods:** To describe a case of a patient admitted to a quaternary service in the metropolitan region of Curitiba with a traumatic pseudoaneurysm and literature review.

**Results:** Cerebral pseudoaneurysms account for less than 1% of all intracranial aneurysms. They are characterized by the rupture of all three layers of the vessel wall, while true aneurysms preserve the adventitia. This fragile configuration can lead to intracranial hemorrhages in up to 60% of patients, with a mortality rate of 31-54%. The most frequent etiology is trauma, with the anterior circulation being the most commonly affected. Involvement of the posterior cerebral artery is uncommon and has few reports in the literature. It is important to consider the possibility of a pseudoaneurysm among the causes of subacute neurological deterioration following trauma, as well as to perform angiographic studies. It is worth noting that in cases of strong clinical suspicion and initial negative angiography, repeat angiography is necessary. The friable nature of pseudoaneurysms, the fusiform morphology, and the frequent absence of a true neck make endovascular treatment superior to surgery, especially with the advent of endovascular stents.

**Conclusions:** Traumatic pseudoaneurysm of the posterior circulation is a rare and treatable condition that should be considered a priority differential diagnosis in patients with cranial trauma, progressive cognitive decline, and presence of SAH.

1542

## Spine

ePoster presentation

Spondylodiscitis: tubercular or pyogenic

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**Objectives:** Importance of biopsy to rule out Pyogenic Spondylodiscitis in endemic tubercular population.

**Background:** Spondylodiscitis is a challenging disease whose diagnosis and management are complex. Tuberculosis (TB) is one of the major causes of morbidity and mortality in developing countries and is the most common differentials in spinal infections. Some patients are empirically treated as tubercular but turn out to be pyogenic.

**Methods:** We reviewed the cases in our department over a one-year period who presented with spinal infections and were misdiagnosed as tubercular.

**Results:** Five patients aged  $64.8 \pm 5.26$  years presented with dorsolumbar spondylodiscitis. Biopsy revealed Streptococcus in three, E coli and Leptospira in one, all of which were empirically treated as tubercular initially.

**Conclusions:** The differentiation between tubercular and pyogenic aetiology is crucial for early diagnosis and timely management. Combination of clinical features and imaging findings can help to initiate early empirical treatment in order to reduce the risk of complications, such as vertebral collapse and cord compression. Biopsy is mandatory in such cases for a confirmed.

1545

## Spine

ePoster presentation

Successful management of traumatic cervical spondyloptosis with incomplete neurological deficit in a child: a case report

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**Objectives:** Share our experience in the management of a rare case of traumatic cervical spondyloptosis in a child.

**Background:** Spondyloptosis is a condition in which there is complete slippage of one vertebral body over the corpus of the adjacent one. It is more common in the lumbar region of the spine, but it very rarely occur in the cervical spine. The management of cervical spondyloptosis represents a challenge to all spine care specialists.

**Methods:** Here we report a case of post-traumatic subaxial cervical spine spondyloptosis with incomplete neurological deficit which was managed successfully by surgery.

**Results:** We describe a case of a 14-years-old male, who was admitted to the surgery department of Souro Sanou teaching hospital for cervicgia with incomplete tetraplegia after falling from a tree. Computed tomography of the neck revealed a posterior C5–C6 spondyloptosis with anterior spondylolsthesis of C7-T1. Surgical intervention was done by anterior approach only seven days after the trauma. The patient underwent a two level cervical corpectomy (C6–C7) with iliac crest fusion and rigid plate fixation. Patient recovered completely after 2 months.

**Conclusions:** Traumatic cervical spondyloptosis is a rare injury with varied clinical presentations. Presently, no consensus is present regarding the best treatment for spondyloptosis. Satisfactory clinical and good outcome can be obtained by anterior cervical corpectomy and fusion.



1546

## Trauma

ePoster presentation

### Penetrating ocular injury causing a pre-pontine haemorrhage and abducens nerve palsy

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**Objectives:** Case report.

**Background:** Penetrating brain stem injuries are often fatal occurrences. Survival following transorbital pontine injuries has been reported however these cases are few and far between.

**Methods:** An 11-year female was looking through a key hole when her friend on the other side forcefully directed a sharp thin object towards her left eye. She experienced immediate onset of severe pain in her left eye. Upon presentation three days later, she complained of headaches, double vision, a weak left leg and 3 episodes of vomiting since the incident.

On examination her Glasgow Coma Scale (GCS) was 15/15, there was some left periorbital swelling and a small subconjunctival haemorrhage. Examination of the extraocular movements was suggestive of a left 6<sup>th</sup> nerve palsy. The lower limb motor exam was normal; proprioception was decreased in the left lower limb.

A small pre-pontine bleed was noted on the Computer Tomography (CT) scan. Magnetic Resonance Imaging (MRI) demonstrated a tract extending from the ventral part of the pons to the cerebellum. 3-Dimensional reconstruction of the imaging on Brainlab® demonstrated the tract and was suggestive of an abducens injury at Dorello's canal.

**Results:** The patient was managed non-operatively with close observation and regular out-patient follow-up. At 6 months follow-up, the abducens's palsy had resolved.

**Conclusions:** Penetrating brainstem injuries can have devastating effects. This patient was fortunate not to have sustained any lethal or debilitating injuries. A combination of physical examination findings, potential trajectory of the penetrating object and radiographic findings can often guide to the diagnosis and further management of such injuries. While penetrating Traumatic Brain Injuries (TBIs) are often obvious it is also quite possible for patients to present with occult injuries. This highlights the importance of a detailed history, focused examination, and scrutiny of imaging post penetrating trauma.

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## Skull Base

Oral presentation

A novel scoring system to determine the proper surgical approach in petroclival meningiomas

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**Objectives:** A novel scoring system to determine the proper surgical approach in petroclival meningiomas.

**Background:** Petroclival meningioma (PCM) is a complex and benign brain tumor of the skull base originating from the meninges. Aggressive tumor removal is recommended for management of PCM, but total resection is achieved in 20% to 85% of patients, and stereotactic radiosurgery is recommended whenever total resection has not been achieved. During last decades, the patients were managed via stereotactic radiosurgery combined with a trans-petrosal approach which is associated with some limitations and drawbacks. Therefore, several surgical approaches have been established for the management of PCM, including orbitozygomatic, transpetrosal, and retrosigmoid approaches. However, there is no scoring system that quantitatively defines which surgical approach is associated with better outcomes, a lower rate of complications, and a lower cost.

**Methods:** We performed a retrospective cohort study designed to investigate the clinical outcomes of PCM surgical removal via a sub-temporal or retro-sigmoid approach. The determination of a proper surgical approach is discussed based on a novel scoring system that has five elements, including neuralgia, the internal acoustic canal (IAC) involvement, the extension of PCM out of >60% superior to middle fossa floor line (MFFL), vascular involvement, and resectable cavernous tumor.

**Results:** Our findings showed that among 86 patients, 46.43 % were managed with the retro- sigmoid approach, 42.86% with the sub-temporal approach, and 10.71% with surgeon choice. There was a significant relationship between the type of surgery and total complications, whereas the lower and higher rates of complications belonged to retro-sigmoid and surgeon choice approaches.

**Conclusions:** Our findings demonstrated that if the score possesses a positive value, the sub-temporal approach is the preferred approach, if the score possesses a negative value, the retro-sigmoid approach is the optimal approach. In cases which the score is zero, the surgeon should determine the best technique.

1548

## Skull Base

Oral presentation

Endoscopic versus microsurgical resection of third ventricle colloid cysts: a single-center case series of 140 consecutive patients

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**Objectives:** Endoscopic versus Microsurgical Resection of Third Ventricle Colloid Cysts: A Single-Center Case Series of 140 Consecutive Patients.

**Background:** Both endoscopic and microsurgery transcortical resection methods are used for colloid cysts of the third ventricle but they have not been compared regarding benefits and pitfalls.

**Methods:** Data of patients who underwent surgical resection of third ventricle colloid cyst via either endoscopic or microsurgery approach by a single surgeon from 2005 to 2020 were retrospectively collected. After administration of criteria, 140 records were retrieved (60 patients through endoscopic resection and 80 patients by a transcranial microsurgery approach). Clinical and surgical measures were compared between the 2 types of surgery after adjustment for confounders.

**Results:** Length of hospital stay, postoperative meningitis, operation time, cyst size, and baseline comorbidities were similar between two groups. Gross total resection (GTR) was achieved for all patients in the microsurgery group, whereas in the endoscopic group, resection was lower (90% vs. 100%;  $P = 0.005$ ). Intraoperative hemorrhage occurred in 14 endoscopic patients (23.3%), whereas for the microscopic group, it was zero ( $P < 0.001$ ). Postoperative shunt was required for 2 patients (one in the endoscopic group and the other in the microscopic group). Two patients had tumor recurrence, both of whom were in the endoscopic group. No mortality was detected in either group. Multivariate analyses were insignificant for confounding effects of clinical and demographic factors in occurrence of worse surgical outcomes (non-GTR and hemorrhage).

**Conclusions:** In our series, the rate of intraoperative hemorrhage was higher with the endoscopic method and GTR was lower, even after adjustment for other factors. This situation could be caused by technological shortcomings and limited space for resection maneuvers and management of complications.

1549

## Paediatric

Oral presentation

### Spinal dysraphism: clinical presentation, management and outcome

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**Objectives:** Analysis of clinical profiles and management options in our patients with dysraphism.

**Background:** Dysraphism is an entity of rare congenital anomalies affecting the fetal development of the neural tube. It is believed to occur in 1-2/1000 live births.

**Methods:** A retrospective descriptive analysis of patients with dysraphism treated in our center between January 2019 and January 2023.

**Results:** We had 32 patients, 6 encephaloceles and 26 spinal dysraphism. Female to Male ratio was 1.3:1. 25 patients were operated within the first 48 hours of life, 5 had ruptured preoperatively. Anatomical locations were lumbar in 53.1%, lumbosacral in 15.6%, and others in 31.3%. According to morphology and content, myelomeningoceles, meningoceles, lipomyelomeningoceles, dermal sinuses, and limited dorsal myeloschisis were encountered in 17, 4, 2, and 1 patient, respectively. 78.1% presented with motor deficits, 53.1% with sphincteric affection, and 40.6% with sensory deficits. Skeletal associations included talipes equino varus in 31.2% and scoliosis in 9.3%. 4 patients had VP shunts inserted in other sessions. Surgical interventions included single-layered simple closure of the dura and skin defect, untethering of the spinal cord, excision of lipomas, and excision of dermal sinus tract. Techniques included rotational skin flaps in 7 patients and bilateral release flank skin incision in 2 patients. Motor improvement was evident in 11 patients and sphincteric improvement in 8 patients. Complications included redo surgery, secondary skin closure, and superficial wound infection in 1 patient each.

**Conclusions:** Early surgical repair of dysraphism is recommended to avoid infection. Delayed CSF diversion was not associated with CSF leak or wound dehiscence. Surgical repair is planned according to the size of the lesion, the integrity of skin, and the ability to dissect enough layers for water-tight closures. Skin rotation, releases, and undermining are good tools. Single-layered dural closure can be safely utilized.

1551

## Spine

ePoster presentation

Investigating the severity of spinal cord compression using qualitative and quantitative MRI scales: a cross-sectional study on 553 patients

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**Objectives:** In this study, we assessed the correlation between qualitative and quantitative MRI scales and clinical symptoms and severity of spinal canal stenosis.

**Background:** When investigating Degenerative Cervical Myelopathy (DCM), Magnetic Resonance Imaging (MRI) is considered the gold standard. This challenging condition is caused by spinal cord compression, which arises from degenerative alterations in nearby structures. However, the degree of measurable compression does not consistently correspond to the severity of the disease, and there needs to be more standardization in the radiological terminology used to describe the compression.

**Methods:** In this retrospective cross-sectional study, MRI was performed on 533 patients. Quantitative and qualitative scales such as Maximum Canal Compression (MCC), Maximum Spinal Cord Compression (MSCC), Spinal Cord Occupation Ratio (SCOR), Compression Ratio (CR), and Transverse area (TA) were recorded, and compared with the qualitative scales and clinical symptoms.

**Results:** One hundred forty-eight patients were recruited (40.6% males). The CSC was significantly different between different qualitative groups. The highest CSC was related to the qualitative III group (19%). The mean of the quantitative measures of MCC and MSCC was significantly higher in patients with CSC (P-value=0.005 and 0.019, respectively), and the mean of CR and TA was significantly lower (P-value=0.002 and 0.015, respectively). According to quantitative measures, the mean MSCC and CR were significantly different between patients with and without upper limb sensory (P-value=0.020 and 0.002, respectively) and motor symptoms (P-value=0.000 and 0.001, respectively).

**Conclusions:** Our findings showed that MSCC and CR were significantly correlated with the sensorimotor symptoms of patients. Patients with compression cords had a significantly higher MCC, CR, and MSCC that was inversely correlated with the mJOA score. Moreover, quantitative variables were significantly correlated with qualitative scores. Therefore, clinicians can use such scales to predict the severity of a patient's status.

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## Oncology

ePoster presentation

### Volume dynamics of subtotally resected benign brain tumors

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**Objectives:** To assess the volume dynamics of subtotally resected benign brain tumors within a 3 months postoperative period and identify subgroups with different volume dynamics.

**Background:** Subtotal resection of benign brain tumors can be a preferred surgical option in several instances, e.g. for tumors with a huge size, peritumoral edema and displacement of critical structures. Usually, postoperative imaging is done within a week, appearing to the surgeon as the definitive surgical result. In situations of internal tumor debulking and hallowing, volume dynamic of the residual tumor might surpass the early postoperative phase.

**Methods:** Patients with benign brain tumors operated on by one of the authors from 2017 to 2022 with a plan for subtotal resection and the principle of internal hollowing were identified. Tumor volume measurements were done based on MRI scans with and without contrast preoperatively, postoperatively within one week and after 3 months.

**Results:** 17 patients were identified, 14 of which had an extraaxial tumor, and 3 an intraaxial tumor. 10 tumors were supratentorial, 7 infratentorial. Preoperative tumor volume ranged from 18 mL to 171 mL. On average, 59% tumor volume reduction was seen in the first week after surgery. 3 months postoperatively, further volume decline of residual tumor of another 52% (min 12%, max 77%) was observed. Subgroup analysis revealed that the volume reduction after 3 months was more distinct in the group of extraaxial tumors (57% volume reduction) compared to the group of intraaxial tumors (31% volume reduction).

**Conclusions:** After the first week of surgery, further significant volume decline of subtotally resected benign brain tumors is possible within 3 months when tumors have been debulked with a hollowing principle while leaving an outer shell of tumor tissue.

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## Skull Base

ePoster presentation

Comparing the odontoid resection techniques pursuant to surgical approach: anterior vs. transaxis

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**Objectives:** The aim of the current study is to compare the most widely used anterior odontoidectomy with the recently introduced posterior transaxis odontoidectomy based on clinical data.

**Background:** The resection of the protruded odontoid is a procedure that is most widely performed via endoscopic endonasal approach, anteriorly, after occipitocervical instrumentation. Patients with craniovertebral junction (CVJ) anomalies like basilar invagination (BI) usually need surgeries being performed in two separate stages. Recently, novel posterior transaxis approach has been introduced in which entire therapeutic goals are safely and effectively accomplished in just a single procedure.

**Methods:** Patients with BI who received odontoid resection surgery were retrospectively reviewed in two groups, according to the chosen surgical approach. A total of 13 patients who underwent odontoid resection, posterior CVJ decompression and occipitocervical instrumentation surgeries at Ankara University School of Medicine, Department of Neurosurgery between 2009 and 2022, were retrospectively reviewed. Patient characteristics, neurological conditions and Modified Rankin Scale scores at admission, operative duration; changes in the intraoperative neurophysiological monitoring; blood loss during operation; odontoid resection rate; postoperative complications and mortality rates were compared.

**Results:** First group (n=7) consisted of patients that underwent anterior odontoidectomy via the endonasal route; and the second group (n=6) included patients in whom the transaxis approach was performed. While two serious complications such as pneumocephalus and basilar artery injury were observed in the first group, occipital plate malposition was the only complication in the second group.

**Conclusions:** The preliminary data supports the successful utility of transaxis approach for odontoid resection that meets entire operative therapeutic demands in just single operative stage. Considering the diminished surgical risks and operative time, the transaxis technique, might be regarded as one of the primary odontoidectomy procedures.

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## Trauma

ePoster presentation

Predictors of outcome in adult patients with traumatic brain injury with particular reference to the initial total white cell count

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**Objectives:** To determine whether the initial total white cell count can be used to predict the outcome of adult patients with TBI.

To determine other parameters such as demographic and clinical features can determine the outcome of TBI patients.

**Background:** Traumatic brain injury is one of the world's leading cause of morbidity and mortality in neurosurgery and is of public health concern, especially in developing countries where there are limited resources. Therefore being able to predict the outcome of patients with TBI early is very important so that the limited resources can be allocated adequately.

**Methods:** A prospective observational cohort study of adult patients with TBI recruited by convenient sampling at Parirenyatwa Group of Hospitals and Sally Mugabe Central Hospital in Harare, Zimbabwe from 1 June 2021 to 31 May 2022. A data collecting tool was used, and data was then verified for completeness and correctness. It was then analyzed using a statistical package by univariate and multivariate analysis.

**Results:** A total of 138 patients were analysed. Elevated total white cell count [OR = 2.01(95% CI 1.26 - 3.17)], pupillary reaction to light [OR = 0.01(95% CI 0.00 - 0.28)], initial GCS [OR = 3.11(95% CI 1.26 - 7.34)], anisocoria [OR = 2.91(95% CI 1.77 - 4.28)], and the Marshall CT scan score [OR = 0.80(95% CI 0.31 - 4.54)] were noted to have a predictive value in the outcome of patients with TBI.

**Conclusions:** Early prediction of outcome of TBI patients is important to help in optimizing treatment strategies. Total white cell count, Marshall CT scan score, initial GCS and pupillary reaction to light can be used as predictors of outcome in TBI. However each of these parameters have their own shortfalls. Therefore I recommend further research studies to combine other parameters and to come up with a TBI outcome prediction scoring system.



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## Functional

ePoster presentation

DREZotomie dans la prise en charge des avulsions du plexus brachial expérience d'Abidjan

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**Objectives:** We present a case of successful pain relief after DREZotomy post traumatic brachial plexus avulsion.

**Background:** Les patients atteints d'avulsion du plexus brachial souffrent fréquemment de douleurs neuropathiques chroniques réfractaires résultant d'une perturbation préganglionnaire de la racine nerveuse de la moelle épinière. La traction traumatique, suivie de la compression, représente la première cause. L'avulsion associe une lésion des composants de la voie de Lissauer (LT) de la moelle épinière, de la corne postérieure de la moelle épinière (PHSC) et du faisceau dorsolatéral, entraînant une physiopathologie complexe de la douleur gérée par neuromodulation ou chirurgie neuroablatrice, la plus utilisée étant la lésion de la zone d'entrée de la racine dorsale (DREZotomie).

**Methods:** Il s'agit d'une étude prospective de type descriptive allant de janvier 2021 à Décembre 2023 portant sur trois cas d'avulsion du plexus brachial avec des douleurs neuropathiques EVA 10/10 rebelles aux antalgiques de palier 3 chez qui la chirurgie a été réalisée à une moyenne de 10 mois post traumatique.

**Results:** On note une diminution des douleurs neuropathiques EVA 0/10 à J1 postopératoire on note une persistance du déficit moteur dans 2 cas il faut noter qu'il y avait une monoparésie 3/5 du membre concerné en préopératoire qui était persistante en postopératoire on note une amélioration de force musculaire après rééducation 4/5 l'évolution à 6 mois marquée par une analgésie complète.

**Conclusions:** Brachial plexus avulsion represents an invalidating injury with management requiring sophisticated instruments, rare in Low and Middle-Income (LMI) settings. However, meticulous study of imaging anatomy could help administer neuroablative treatment to improve the patient's quality of life.

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## Paediatric

ePoster presentation

### Primary intracranial congenital glioblastoma: a systematic review of case reports from 2000 to 2023

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**Objectives:** To determine the clinical manifestations, number of reported cases, radiological findings and neuro-oncological management of PICG.

**Background:** The most commonly reported congenital intracranial space occupying lesions are teratoma, glioma and neuroblastoma. Primary intracranial congenital glioblastoma (PICG) is one of the most lethal and extremely rare neoplasms. Most pediatricians and gynecologists are unable to detect it congenitally, posing an ominous risk of spread and disease severity.

**Methods:** A comprehensive literature search using PubMed Central, Google Scholar and Scopus was done, retrieving 17 case reports and five case series of 31 patients with PICG and included using the PRISMA guidelines, published between 2000 and 2023.

**Results:** The mean age at presentation was  $86.00 \pm 88.36$  days, with both genders affected equally, i.e. 45.16%. The most common symptoms and signs at presentation were seizures (38.70%) and hydrocephalus (51.61%), respectively. Left hemispheric (48.38%), with frontoparietal involvement (16.12%) was the frequently reported site of lesion. MRI findings were suggestive of low intensity signal significant of hemorrhage or calcification and a heterogenous mass in 35.58% and 32.25% cases, respectively. Gross total resection (GTR) was achievable in 48.38% patients. Glial fibrillary acid protein and vimentin were positive in 45.16% and 29.03% cases, respectively. Post-operative complications of motor neurological deficit in 25.80% and seizures in 19.35% were noted. Intraoperative mortality and recurrence were noted in 25.80% and 9.68% of patients. The average follow up duration was 20.57 months.

**Conclusions:** PICG has an extremely aggressive course of natural progression. Congenital presentation and its lack of awareness among clinicians is itself a challenge for disease management. Adjuvant chemo-radiotherapy has proven fruitful along with GTR. Post-operative CSF diversion is warranted.

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## Spine

ePoster presentation

Clinical predictors and surgical outcomes following surgical treatment in patients with cervical spondylotic myelopathy: a prospective study of 57 cases

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**Objectives:** Objectives of our were to assess the outcome of patients operated for CSM using m-JOA and Recovery rate and evaluate clinical factors predicting surgical outcomes.

**Background:** Although Surgery for CSM started in Ethiopia more than a decade ago, there are no published prospective studies in which surgical outcomes are systematically quantified in our setup. In this context, it would be of benefit to study surgical a outcomes and it's predictors in our set up.

**Methods:** Adult CSM patients fulfilling inclusion and exclusion criteria were enrolled at two hospitals. Patients were followed prospectively for a minimum of 06 month, with mJOA score, recovery rate ( using Hirabayashi formula) and Postoperative complications assessments. Possible clinical predictive factors were also assessed.

**Results:** There were 38 men and 19 women (mean age, 50.63 yr) enrolled in our study.. 48 patients had anterior cervical procedure, 9 patients had posterior procedures..The mean mJOA scores at 6 months (13.33) and 1 year(14.74) after surgery were significantly higher than the mean preoperative mJOA (10.44) (P=0.01). 42(73.4%)patients had recovery, 7 patients (11.9%) remained the same while 8 (13.6%) patients worsened. Average recovery ratio was 36.59 ± 37.12% in young patients(<65yrs) and 2.4 ± 47.10% in the group older than 65 years (P = 0.043). Rate of recovery in patients with symptom duration of < 1 year was found to be better than those presented with symptom duration of > 1year(39.11% vs 15.54%) with p-value=0.035. Six patients had new neurologic deficit in the immediate postoperative period.

**Conclusions:** Surgical treatment of CSM was associated with significant improvement in mJOA and recovery rate at 6 and 12 months. Age and duration of symptom were highly predictive of surgical. Our study showed a high rate of immediate post op neurologic deterioration but other complications in our study were comparable with those in previously reported CSM series.

## Endovascular Neurosurgery

ePoster presentation

eCLIPs as a novel promising treatment for wide-necked bifurcation aneurysms; a systematic review and meta-analysis

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**Objectives:** In the present systematic review, we sought to investigate the safety and efficacy of eCLIPs devices in managing patients with WNBA of different arteries to highlight the impact of eCLIPs.

**Background:** Wide-necked aneurysms are a group of cerebral aneurysms with necks  $\geq$  4mm. Wide-necked bifurcation aneurysm (WNBA) is a challenging intracranial aneurysm. Several device and treatment approaches have been proposed for the treatment of WNBA. The endovascular clip system (eCLIPs) is a newly developed endovascular device which has flow diverter and flow disruptor features.

**Methods:** This is a systematic review and meta-analysis study conducted based on the Preferred Reporting Items for Systematic Reviews and MetaAnalyses (PRISMA). The electronic databases of PubMed, Embase, Scopus, and Web of Science were systematically reviewed from inception to June 19, 2023. The rate of complete and near-complete occlusion rate, successful device implantation, and series of adverse events was pooled by STATA V.17.

**Results:** A total of five studies with 110 patients with WNBA were systematically investigated. Our findings show that the immediate successful implantation rate of eCLIPs was 0.93 [95%CI:0.88-0.97]. Moreover, the immediate postoperative complete occlusion rate was 0.34 [95%CI:0.10-0.58], P-value<0.001, and the immediate postoperative near complete occlusion rate was 0.35[95%CI:0.24-0.45], P-value<0.001. Moreover, the near complete occlusion rate at the latest follow-up was 0.3[95%CI:0.16-0.44], P-value<0.001 The series adverse event rate was reported as 0.14 [95%CI:0.05-0.22]. Stroke was also reported in two studies, in which one study reported one patient suffered from stroke within the first 24 hours and another one reported no patients with stroke. Mortality was reported in five studies ranging between 0% to 6%, which was related to procedures or not. Two studies also reported no death following eCLIPs.

**Conclusions:** Based on the data presented in this meta-analysis, the eCLIPs has demonstrated favourable outcomes and safety profile for WNBA compared to the presently available devices for managing WNBA.

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## Spine

ePoster presentation

### Surgical site infection rate in spine surgery; a three year retrospective review of incidence and risk factors

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**Objectives:** This study was conducted to determine the Surgical site infection rate, and evaluate the associated risk factors, in spine surgeries done at the Jos University Teaching Hospital, over a three year period.

**Background:** Surgical site infection (SSI) occurring after spinal surgery is a major source of peri-operative morbidity, with reported incidences in the literature ranging from 0.22% to 16.4%.

**Methods:** We performed a retrospective cohort review of all patients who had spine surgery between January 2017 and December 2019. Patient's hospital record were retrieved and relevant biodata data and clinical information were obtained and entered into SPSS version 25. Univariate and multivariate analysis were done, and risk factors for SSI was analyzed using fisher's exact test with level of significance set at p- value <0.05 at 95% confident interval.

**Results:** A total of 61 patients, aged 3 – 80 years were reviewed. Trauma (49.2%) was the most common indication for surgery (49.2%), cervical spine (44.3%) was the most operated segment. Posterior approach (62.3%) was used commonly, with most (65.6%) of the surgeries being instrumented spinal surgeries. We observed a SSI rate of 11.5% (majority being superficial SSI). Female sex (4/12, 25.0%), age >60year (2/8, 22.2%), posterior approach (6/32, 15.8%), spine instrumentation (6/34, 15.0%) and surgery ≥4.1 hours (5/24,17.2%) were associated with higher SSI rate, however none of these associations were statistically significant.

**Conclusions:** Our study found a relatively high infection rate in our practice, with more of superficial, than deep organ space infections. These infections were seen more in females, posterior surgical approach, instrumented spinal fusion and patients in patients whose surgery lasted greater 4hours. Identification of these risk factors may prove useful for patient counseling and ongoing efforts aim at preventing SSI. Ultimately, this will reduce morbidity, mortality, length of stay, and eventually, costs of care in spinal surgery patients.

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## Spine

ePoster presentation

Feasibility of high-fidelity simulator models for minimally invasive spine surgery in a resource-limited setting – experience from East Africa

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**Objectives:** To evaluate the feasibility of the use of high-fidelity simulator models for MISS spine surgical training in resource-limited setting.

**Background:** Spine surgery is a rapidly evolving specialty with a continuous need to learn new skills. In resource-limited settings like Africa, the need for training is greater. The use of simulation-based training is important at different stages of skill acquisition, especially for high-stakes procedures like spine surgery. Among the available methods of simulation, the use of synthetic models has gained popularity among trainers.

**Methods:** Twenty participants in a Neurosurgery training course, most of whom (65%) were neurosurgery residents and fellows, were recruited. They had hands-on training sessions using a high-fidelity lumbar degenerative spine simulation model and thereafter had hands-on theater experience. After this, they completed a survey to compare their experiences and assess the effectiveness of the lumbar spine model in simulating real patient and surgery experiences.

**Results:** The participants were from four African countries, and the majority were neurosurgery residents. There were varying levels of experience among the participants in minimally invasive spine surgery (MISS), with the majority either having no experience or having only observed the procedure. All the participants reported that the high-fidelity lumbar spine model effectively simulated real MIS setup, real bone haptics and was effective in learning new techniques. Most of the participants agreed the model effectively simulated real dura and nerve roots (95%), real muscle (90%), real bleeding from bones and muscles (95%), and real CSF in the subarachnoid space. Among them, 95% agreed that the model is effective in lumbar MIS training in resource-limited settings.

**Conclusions:** With the development of new and better surgical techniques, the use of high-fidelity models provides a good opportunity for learning and training, especially in resource-poor settings where there is a paucity of training facilities and personnel.

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## Paediatric

ePoster presentation

### Management of craniosynostosis and the expanding Zimbabwean experience

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**Objectives:** 1. Describe the new Zimbabwean Craniofacial experience.

2. Share the craniosynostosis case experience so far.

**Background:** Craniosynostosis is defined by the premature fusion of cranial sutures resulting in the abnormal head shape that prompts caregivers to seek help. Its incidence has increased and now ranges from 3.1-7.2/10000 live births. The spectrum includes complex syndromic associations requiring a multidisciplinary approach. Craniofacial surgery is expanding worldwide with clear referral pathways and management protocols. Craniosynostosis is under diagnosed in Zimbabwe resulting in future adverse outcomes manifesting as mental retardation, poor mental development and cosmetically abnormal head shapes. The service in Zimbabwe is expanding as a new entity. We give our experience to date.

**Methods:** All patients undergoing surgery for Craniofacial correction of craniosynostosis were included for presentation of the surgical procedure of choice and the outcomes.

**Results:** Syndromic and non syndromic synostosis cases were successfully managed with good cosmetic and development outcomes to date.

**Conclusions:** Craniosynostosis is under-diagnosed in Zimbabwe, it can now be successfully performed in Zimbabwe with satisfactory outcomes if done at the appropriate time. The service is expanding and seeks to intervene more as referrals increase.

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## Functional

ePoster presentation

Positive predictive factors for MVD and technical noteghoms

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**Objectives:** The main objective was to determine positive factors that influence success of MVD.

**Background:** Trigeminal neuralgia is a menacing condition and adversely affects quality of life. Various options of treatment exist but MVD is gold standard. Proper patient selection is key if a successful MVD is to be realised. The factors which affect outcome are numerous.

**Methods:** A prospective observational study was done on all patients who underwent MVD and depending on their outcome at 3 months. Positive determine factors were established.

**Results:** Of the 3 patients who underwent MVD during the time period, 2 had good outcomes and both have something in common. The patients had type 1 TGN, They had triggerable factors and all responded to AEDs.

**Conclusions:** In carefully selected patients, MVD portends good outcomes in patients with TGN.



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## Oncology

ePoster presentation

Primary Intracranial Leiomyosarcoma (PICLMS): a systematic review of case reports from 2000 to 2023

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**Objectives:** To determine the epidemiology, clinico-pathological patterns and neuro-oncological management of PICLMS.

**Background:** Leiomyosarcoma (LMS) is a rare malignancy of the smooth muscle cell and it can involve any organ, uterus being the most frequently affected organ. Lungs and liver are the frequently reported sites of metastasis. Cases involving the central nervous system (CNS) primarily without any evidence of systemic disease have emerged, questioning its oncologic origin from brain parenchyma and meninges.

**Methods:** After an extensive literature search using PubMed Central, Google Scholar and Scopus, twenty four case reports and one case series comprising 36 patients with PICLMS were retrieved and included using the PRISMA guidelines, published between 2000 and 2023.

**Results:** Male preponderance of the neoplasm (55.56%) with the mean age of  $43.10 \pm 15.37$  years was noted. Diagnosis of pediatric PICLMS was made among 13.89% of patients. Headache, head mass and motor neurological deficit were the most common presenting clinical manifestations among 17.02%, 13.83% and 11.70% patients, respectively. PICLMS arose from brain parenchyma in 75.03% cases, mostly involving the frontal lobe (19.44%) and left hemisphere (36.11%). Meningeal, venous and bony origins were also seen. Heterogenous mass was noted among 21.79% cases on MRI. Gross Total Resection was possible in 63.89% lesions. Smooth muscle actin, Glial Fibrillary Acidic Protein and S-100 were positive among 21.79%, 7.69% and 6.41 of patients on immunohistochemistry, respectively. A mean follow up of  $21.32 \pm 22.64$  months was noted. Intracranial recurrence was noted in 33.33% patients.

**Conclusions:** Surgery and adjuvant radiotherapy are the mainstay of treatment of PICLMS, while meningioma an important differential diagnosis. Its highly variable presentation on T1-, T2- weighted and FLAIR images makes MRI an unreliable investigation to diagnose PICLMS pre-operatively. High recurrence rate, combined with aggressive behavior make keen follow up essential. Fruitful chemotherapeutic regimens can only be developed after seeking the oncologic origin of PICLMS.

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## Spine

ePoster presentation

Cross-sectional study of recurrent disc herniation risk factors and predictors of outcomes after primary lumbar discectomy: a STROBE compliance

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**Objectives:** This study aimed to determine the predictors of recurrent lumbar disk herniation (rLDH) and the associated risk factors.

**Background:** The rLDH is becoming common and knowing that lifting weight, smoking status, occupational work, and diabetes can be predictors and the outcome can be influenced by the reoperated level and side will greatly better the patient's care.

**Methods:** From June 2010 to July 2019, the 2196 consecutive patients who underwent first-time single-level lumbar discectomy at our institution were revised. Data on first lumbar spine surgery, reoperation, and preoperative data were brought into the analysis. Multivariable Logistic Regression Analysis was performed in JAMOVI 2.2.5 with the Cox-regression Kaplan–Meier analysis for rLDH excision at the L4L5 and L5S1 levels.

**Results:** Seventy-five cases (74.25%) met the inclusion criteria. There were 54 cases of ipsilateral recurrent herniation and 21 contralateral with a male predominance of 64% (n = 48). The average age at the time of recurrence was 48 ± 9.34 years (age range 29-67 years). The group of diabetes patients who smoke is at high-risk, Odds 2.77, 95%CI [0.82 - 9.43], of rapid recurrence for lumbar disc prolapse; about 3 months after the first surgery followed by the group of diabetes who lift a weight, Odds 0.83, 95%CI [0.28 - 2.42], about 4 months after the first surgery. At the L4L5 level, only the group of patients operated for opposite side recurrence, Odd ratio 1.01, 95%CI [0.30 - 3.33], did well and were pain-free immediately after surgery compared to the group of patients operated for recurrence on the same side, Odd ratio 6.73, 95%CI [2.13 - 21.21].

**Conclusions:** Diabetes and smoking status increases the risk of rLDH and the patient's outcome is favorable without the need of physiotherapy when the recurrence is on the same level and opposite side.

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## Hydrocephalus

ePoster presentation

Laparoscopic-secured suprahepatic placement of the distal catheter of VP shunt in hydrocephalic infants: case series with 5 years follow up

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**Objectives:** The aim of this study is to present a novel technique for the placement of the distal end of the vp shunt in efforts to reduce postoperative complications.

**Background:** Ventriculoperitoneal shunting (VPS) is the most accepted treatment for hydrocephalus but carries a significant risk of VP shunt malfunction. This study aims to present a new technique in the placement of the peritoneal end of the VP shunt in which the distal end is placed laparoscopic suprahepatic with efforts to secure it in the suprahepatic space and its influence on postoperative outcome.

**Methods:** Between January 2017 and September 2017, a total of 15 patients, less than 6 months old, underwent first time VPS placement at Cairo university specialized pediatric hospitals. We analyzed independent variables (age, gender, clinical presentation and surgical technique) and dependent variables (operative time and post-operative complications) and occurrence of shunt failure. Patients were followed up for 5 years after VP shunt placement with our presented technique.

**Results:** Mean operative time The operative time (skin-skin) ranged from 36-39 minutes (mean 37.5±0.8 minutes). Patients were routinely followed for a minimum of 6 years after VPS placement The incidence of shunt failure during the entire follow-up period was significant there was one case (6.7%) of distal catheter obstruction which underwent laparoscopic revision after 5 months. Also, there was one case of proximal obstruction (6.7%) underwent proximal revision after 4 years and 2 months of surgery.

**Conclusions:** According to our study, laparoscopic VP shunt insertion is a safe, minimally invasive treatment option for insertion of the peritoneal end of the VP shunt which has many advantages over the conventional laparotomy. We strongly suggest the laparoscopic technique as an alternative technique for peritoneal catheter placement during ventriculoperitoneal shunting.

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## Hydrocephalus

ePoster presentation

The usefulness of Diagonal Ventricular Dimension in the assessment of blocked shunt

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**Objectives:** Interrogated the utility of using the Diagonal Ventricular Dimension to objectively, reproducibly and proportionally measure ventricular dimension (linear) and compared with Evans Index and Front-Occipital Horn Ratio as a tool to detect changes in size. Additionally to establish Diagonal Ventricular Dimension as a tool to provide useful parameters to establish shunt malfunction, based on imaging studies as appropriate technology.

**Background:** Shunt blockage is a common complication in patients who are shunted to alleviate hydrocephalus. Symptoms and signs of shunt blockage may be clinically non-specific. It is an emergency and the definitive management is surgical. Diagonal Ventricular Dimension is a tool to aid in the Diagnosis of the blocked shunt and ensuing ventricular enlargement and aids in management decisions.

**Methods:** CT Scans were measured for patients using the Evans Index, Fronto-Occipital Horn ratio and Diagonal Ventricular Dimension. Baseline (Blockage) and Results were computed for baseline (shunt blockage) and second reading (after revision 2 days- 6 weeks). Comparison of pre and post operative ventricle size were then made and raised intracranial pressure was confirmed intra-operatively. Comparisons were made of the 3 tools.

**Results:** 21 patient scans were compared. The Diagonal Ventricular Dimension was found to consistently and accurately demonstrate ventricular changes compared to the Evans Index and the Front-Occipital Horn Ratio. Specificity 100%, Sensitivity 100%, for confirming cerebrospinal fluid under pressure. Computed P values were 0.001 for Diagonal Ventricular dimension, 0.011 for Evans Index and 0.551 for Front-Occipital Horn ratio.

**Conclusions:** The diagonal Ventricular Dimension is superior to Evans Index and Front-Occipital Horn ratio as an indicator of enlarged ventricles and is simpler to use than the other two methods.

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## Spine

ePoster presentation

Case report: management of a case of an intradural intramedullary arachnoid cyst

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**Objectives:** N/A

**Background:** Intramedullary spinal arachnoid cysts are a rare entity and must be considered in differentials of intramedullary pathologies. These cysts have neither age nor gender predilection. Despite being relatively benign, and occasionally incidental, some cause compression and ensuing loss of function. Once identified and treated timeously, function may be regained with comprehensive, sustained and tailored neuro-rehabilitation. Good outcomes in neurosurgery require follow-up, documentation, time and effort. This slow and steady process requires patience.

**Methods:** Case of a 6 year old female, who suffered an exacerbation of her condition (unidentified at the time), which then subsided, but subsequently returned with progression. Fortunately the pathology was identified, and surgically managed.

**Results:** Finding: an intramedullary arachnoid cyst. Thereafter a rigorous neurorehabilitation program, was instituted, which eventually saw her regain complete functionality.

**Conclusions:** Surgical intervention is not a panacea and is just the beginning. As neurosurgeons, when dealing with such a crucial aspect of patient functionality, the team must be committed to the entire process of the patient reaching neuro-optimization. It is important to share our experience in finding a rare condition as this intramedullary arachnoid cyst and managing it to the patient's neuro-restoration.

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## Oncology

ePoster presentation

### Evolution of surgical strategies for intraaxial brain tumor surgery in Bucaramanga (Colombia)

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**Objectives:** 1. To demonstrate the experience in intraxial tumor resection and the implementation of awake surgery as a rule, not as an exception, for tumors regardless of their location in the right or left hemisphere.  
2. To describe the increasing use of intraoperative ultrasound with intracavitary probe for real time visualization during brain tumor resection, even in replacement of Neuronavigation, comparing with Magnetic Resonance Imaging (MRI).  
3. Describe the experience and usefulness of other tools such as 5 ALA fluorescence-guided surgery, neuronavigation, Stereotactic surgery.

**Background:** In order to achieve the goal of maximal safe resection, that influences the parameters of progression-free survival, quality of life and survival, we have implemented a series of tools and strategies, we describe the advantages, disadvantages, possibilities of implementation, trying to determine which tools are considered essential.

**Methods:** We have collected information with the neurosurgery research group of the Universidad de Santander from medical records and outpatient follow-up in two institutions (Los Comuneros Hospital Universitario de Bucaramanga and Clinica Chicamocha de Bucaramanga) since 2005, when we started brain tumor resection surgery with Neuromonitoring, until May 2023, and different tools for the resection of intra-axial brain tumors are discussed.

**Results:** We evaluate the tools such as awake surgery, neuromonitoring, (Fig 1) ultrasound, Fluorescence 5 ALA guided surgery, stereotactic surgery for intraaxial tumor resection, determining its impact on tumor resection volume.

**Conclusions:** Awake surgery with intraoperative neuromonitoring and multitasking evaluation provides the most important strategy for intra-axial brain tumor resection, independent of the hemisphere of lesion location. Ultrasound is a very important tool for visualization in real time that provides guidance and greater confidence at the time of resection, being a tool widely available today in many surgical settings. Other tools, such as Fluorescence 5 ALA guided surgery, stereotactic surgery, have important utility for the surgery of brain tumors.

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## Spine

ePoster presentation

Direct health care cost for traumatic spinal cord injured patients from index care at Parirenyatwa Hospital to discharge from rehabilitation center

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**Objectives:** Study aimed to calculate estimates of direct health care cost (DHCC) for patients aged 13 years and older with traumatic spinal cord injury (TSCI) from index admission at Parirenyatwa hospital (PH) to discharge from index inpatient rehabilitation.

**Background:** Cost of illness studies are pivotal in the setting of public and private health care budgets at all levels in assessing the impact of investments in research to prevent, detect, and treat diseases.

**Methods:** A retrospective cross-sectional cost of illness study, where recruitment was limited to traumatic spinal cord injured patients aged 13 years and over, from index inpatient care at PH to direct transfer for index inpatient rehabilitation until discharge for the period 1 January 2014 – 31 December 2017. A data collection tool was used and a mixed methodology bottom-up and top-down micro and gross costing was employed. Consent was sought from the two institution's accounting officers to go through patients medical and financial records at the two institutions. No informed consent was sought since there was no patient contact. Results were analyzed using an accounting and statistical software.

**Results:** 56 patients completed treatment with a male to female ratio of 2.7:1 and a mean age of 36.7 (SD 15.3) years. Overall, mean DHCC for both acute care and index inpatient rehabilitation until discharge per patient was US \$10 498.53 (SD US \$ 6 653.79). The major cost driver being inpatient rehabilitation care where the mean cost constituted 76.6% of the overall mean total DHCC at US \$ 8 042.55 (SD US \$ 6 470.98).

**Conclusions:** The major cost driver for patients with TSCI was inpatient rehabilitation that was spurred by the high LOS as well AIS-A of the spinal cord injury. Spinal cord injury affects mainly young males and motor vehicle crash was the leading cause for presentation.

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## Oncology

ePoster presentation

The antimicrobial activity profiling and biochemical characterisation of paediatric adamantinomatous craniopharyngioma cystic fluid

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### Objectives:

- To determine the epidemiological distribution of craniopharyngioma in Zimbabwe.
- To profile anti-microbial activity and biochemical properties of adamantinomatous craniopharyngioma cystic fluid.

**Background:** Craniopharyngioma is a rare but challenging condition to manage. Majority have a cystic component that has triggered interest in the past decade because of the management options it offers. However not much is known about the composition and characteristics of this cystic fluid.

**Methods:** A cross-sectional study was carried out in Zimbabwe over a two year period, to determine the epidemiological distribution of CP, the antimicrobial activities and biochemical profiles of the craniopharyngioma cystic fluid that was performed on 9 of the CP samples.

**Results:** Incidence of CP was 0.53 per million person-years with a male preponderance of 2:1. *Antimicrobial activities of the tumour fluid were demonstrated for the first time.* The work demonstrated strong inhibition of gram positive microbial growth comparable to streptomycin and ampicillin in CP cystic fluid. Furthermore, several biochemical components were found to be elevated significantly (up to 15 times) compared to serum and CSF. These are sodium, potassium, urea, alkaline phosphatase, phosphate, magnesium, albumin, Gamma Glutamyl Transferase (GGT), calcium, low-density lipids and glucose.

**Conclusions:** This novel finding is a gamechanger in management of CP with Ommaya reservoirs. The finding proves that the risk of infection in Ommaya reservoirs for CP treatment is mostly theoretical. In addition, by exposing the biochemical composition of CP fluid, the results provides important pointers for further development of targeted chemo-therapeutics. Furthermore, the study lays a strong platform for future antimicrobial development in a world where antibiotic resistance is threatening the fabric of medicine.



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## Spine

ePoster presentation

### Comparing perioperative and postoperative outcomes and complications of ALIF and LLIF

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**Objectives:** To compare complications can occur in both approaches the ALIF and the LLIF, to see what the advantages and disadvantages are during the perioperative and postoperative.

**Background:** LLIF is an approach through the lateral retroperitoneal corridor, transpsoas. ALIF is described as an alternative to interbody fusion, with approach variations described as retroperitoneal, transperitoneal, open, and laparoscopic.

**Methods:** This is a literature review article. A MEDLINE search was conducted through PubMed, Google Scholar, Science Direct, and Cochrane to identify articles that reported the differences between ALIF, LLIF, and other lumbar interbody fusion approaches, focusing on the complications, cost and length of surgery, length of hospitalization, narcotic use, sagittal balance, and surgical technique.

**Results:** There was no overall significant difference in postoperative narcotic use, fusion rate, or disc height. However, ALIF was seen to have better postoperative sagittal balance. Although long-term complication rates between ALIF and LLIF are not statistically significant, both procedures have procedure-specific complications. Intraoperative blood loss and operative time were relatively higher in ALIF than in LLIF. The risk of injury to the lumbar plexus and iliac vessels is relatively higher than ALIF.

**Conclusions:** ALIF and LLIF are considered safe, effective, and non-invasive. Both procedures present their pearls and pitfalls, but LLIF is associated with more complications than ALIF, although they do not present great differences of clinical outcomes. There is a need for more extensive research to determine the best approach.

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## Paediatric

ePoster presentation

### The role of Helmet Therapy in craniosynostosis: a systematic review

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**Objectives:** The review assesses and summarizes evidence on the outcomes (cranial morphology, reoperation, and parental satisfaction) of HT in patients with craniosynostosis.

**Background:** Helmet Therapy (HT) after strip craniectomies moulds head shape by influencing growth at pressure points and prevents cranium from reverting to its original shape after surgery. Despite the increasing adoption of post-operative helmet therapy (HT) for craniosynostosis, its impact on the skull morphology, reoperation rate, and parental satisfaction is not well-established.

**Methods:** We conducted a literature search in accordance with PRISMA guidelines. From 1st January 2011 to 9th September 2021, an advanced electronic search was conducted using the keywords 'helmet' and 'craniosynostosis' in PubMed, Cochrane Central Register of Control Trials, AMA Journals, Ovid Medline, and JSTOR. The quality of studies was assessed through National Heart, Lung and Blood Institute (NHLBI) Quality Assessment Scale. Primary outcomes of interest included reoperations, change in skull morphology, reoperation rate, and parent satisfaction.

**Results:** 15 studies describing 482 patients were included. 410 patients received HT after endoscopic repair, 43 patients received HT after open procedure, and 29 patients did not receive HT. The cohort included metopic, unicoronal, bicoronal, and unilateral lambdoid, sagittal, combined metopic-sagittal and multi-suture craniosynostosis. Results showed that post-operative HT improves cranial indices, and lowers the risk of reoperation. Approximately 12 months of age is the optimal time frame for HT. Infants receiving HT have good quality of life, and with adequate parent satisfaction, the rate of compliance is high.

**Conclusions:** HT act as a useful adjunct to strip craniectomies and can significantly improve cranial morphology after surgery. This review identifies the evidence and knowledge gaps regarding appropriate indicators for measuring changes in head shape after treatment. Long-term follow-ups are required to assess the child's cognitive function and need for reoperation.

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## Trauma

ePoster presentation

Extradural haematoma's bleeding source related to clot demographics and patient prognosis

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**Objectives:** This study aims to relate the source of EDH to clot volume, location, density, and overall patient prognosis.

**Background:** EDHs are associated with significant morbidity and mortality but can have favourable outcomes with timeous interventions. EDHs classically originate from the middle meningeal artery, but can arise from a variety of sources. Previously it has been shown that clot demographics can affect patient outcomes, and, as source of bleed can affect these factors, it could be postulated that there is a correspondence between source of bleed and patient prognosis.

**Methods:** Adult patients admitted to Tygerberg Hospital between January 2011 and March 2022 for management of EDHs were included. CT imaging and patient records were accessed electronically retrospectively. Imaging and clinical findings were compared, and to the patient's outcome at discharge reported using the Glasgow Outcome Scale Extended (GOS-E).

**Results:** The source with the highest average volume was from a generalised venous ooze followed by middle meningeal artery (MMA), at 112,63ml and 75,61ml respectively. Generalised venous oozes and MMA bleeds are generally located in the parietal region (66,67% and 48,57% respectively), skull vault fracture bleeds in the frontal region (61,11%), and sinus bleeds in the frontal and parietal regions equally (at 37,50% each). Heterogenous clots are associated with larger average volumes than homogenous at 60,80ml and 31,85ml respectively. Volume alone does not affect prognosis. The clot location and source of bleed corresponds with patient prognosis.

**Conclusions:** There is a relation between source of bleed and its subsequent location and effect on patient prognosis. The volume of a clot is affected by its source, however this does not translate into a change in patient outcome when taking into considerations other factors surrounding patient management. The study findings aim to contribute to the body of evidence informing prioritisation of patient care and thus patient outcomes.

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## Oncology

ePoster presentation

Introducing endoscopic endonasal pituitary tumor surgery: lessons learnt

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**Objectives:** To describe the lessons learnt during the introduction of endoscopic endonasal pituitary tumor surgery.

**Background:** The endoscopic endonasal pituitary tumor surgery for sella and suprasellar tumors has come in handy in the management of these complicated pathologies. The complexities of navigating through to excise pituitary tumours has a learning curve that takes proactive learning, practice, and good planning to avoid and to manage complications successfully.

**Methods:** This was a retrospective descriptive study looking at cases managed in a tertiary institution. The epidemiology, presentation, surgery and outcomes post-surgery were analyzed.

**Results:** Various complications unique to pituitary tumor surgery including hormonal imbalances, cerebrospinal fluid leak and intracranial hemorrhage were encountered. Unique solutions were tailormade in the planning of the subsequent surgeries.

**Conclusions:** The introduction of endoscopic pituitary tumor surgery was done successfully in our unit and challenges were faced but solved with important lessons for improvement.

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## Hydrocephalus

ePoster presentation

Landscape and incidence of hydrocephalus at major referral hospitals in Zimbabwe

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**Objectives:** The primary objective of this research was to investigate the landscape and incidence of hydrocephalus at major neurosurgery referral hospitals in Zimbabwe: namely Parirenyatwa group of hospitals, Sally Mugabe hospital and Mpilo hospital.

To determine the incidence of hydrocephalus at the major neurosurgery referral hospitals in Zimbabwe.

To describe the demographic distribution of hydrocephalus with respect to age, sex and area of residence.

**Background:** Hydrocephalus is a common condition in neurosurgery either occurring as a single entity, or as a complication of another condition or as part of a syndrome. There are no local studies completed to date to ascertain the actual burden of hydrocephalus in our country. The objective of this study is to determine the incidence of hydrocephalus and describe its demographic distribution and associated factors in patients seen at all the major referral hospitals in Zimbabwe.

**Methods:** A prospective cross-sectional descriptive study of hydrocephalus patients seen at Parirenyatwa hospital, Sally Mugabe Hospital and Mpilo hospital from January 2022 to December 2022 was conducted. A data collection tool was used to obtain data from hospital records and ongoing databases. This data was subjected to statistical analysis.

**Results:** The study recruited 281 (163M vs 118F) and incidence of congenital hydrocephalus was 21.34 /100 000. Eighty nine percent were paediatric with infants comprising 63% of the cases. There was a slight male predominance of 58%. There were 10,1% HIV positive cases. Macrocephaly was found in 65% . post infectious hydrocephalus was found in 48% of the patients. MRI done on 8% of the cases and 90% had communicating hydrocephalus with 99% getting shunted.

**Conclusions:** The incidence of hydrocephalus in Zimbabwe at the three major referral hospitals was found to be lower than the expected figures which may reflect a weakness in referral systems, health seeking behavior, access or record keeping. Hydrocephalus mostly affected infants.

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## Paediatric

ePoster presentation

Managing subdural empyema and brain abscesses in the age of antimicrobial resistance: a retrospective study of pediatric cases in Moscow

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**Objectives:** This study aimed to retrospectively compare and evaluate the effectiveness of different management approaches in children with subdural empyema and brain abscesses.

**Background:** Subdural empyema and brain abscesses are serious and potentially life-threatening conditions in children. The effectiveness of different management approaches for these conditions has not been fully evaluated.

**Methods:** The medical records of 49 children diagnosed and treated for subdural empyema or brain abscess at the Morozovskaya DGKB DZM in Moscow from September 2019 to April 2023 were analyzed. Patients' data, including clinical presentations, neurological status at admission, radiological imaging, predisposing factors, anatomical locations, surgical history, antibiotic therapy details, complications, cultured organisms, and neurological outcomes, were extracted from the Unified Medical Information and Analytical System (EMIAS) of the city of Moscow. Statistical analysis was performed using IBM SPSS version 26, with a significance threshold of  $p < 0.05$ .

**Results:** With a bimodal distribution of ages and a median age of 8.5 years, the study's participants were primarily male. Parenchymal brain abscesses were the most prevalent (46.94%), followed by subdural empyema (26.53%), and epidural abscess (26.53%). Direct contact from adjacent cranial infections, notably sinusitis, emerged as the primary predisposing risk factor (59.18%). Clinical presentations encompassed fever, headache, focal neurological deficits, and seizures. Antibiotic therapy was administered to all patients, and surgical treatment was performed in 81.63% of cases. Antibiotic therapy was adjusted based on culture results, and continued for variable durations. The median hospital stay 25.5 days, and at discharge, no permanent neurological deficits or fatalities were observed. Follow-up imaging at six months revealed no residual lesions.

**Conclusions:** This study highlights the importance of an interdisciplinary approach to the management of subdural empyema and brain abscesses in children. Minimally invasive differentiated methods of surgical treatment have shown high effectiveness. Further research is needed to identify the most effective management approach for these conditions.

## Neurovascular Surgery

ePoster presentation

Analysis of patients with ruptured cerebral aneurysms: comparison of clinical variables and functional outcome between wide-neck and narrow-neck aneurysms

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**Objectives:** To compare clinical variables between patients with wide-neck and narrow-neck cerebral aneurysms. To evaluate the functional outcome of these patients based on measures such as the Hunt-Hess scale, modified Rankin Scale, and rate of delayed cerebral ischemia.

**Background:** Ruptured cerebral aneurysms represent a severe and potentially life-threatening condition, requiring immediate neurosurgical intervention. This study aims to compare patients with wide-neck and narrow-neck aneurysms in terms of clinical variables, such as age, Hunt-Hess scale, aneurysm size, modified Rankin Scale, rate of delayed cerebral ischemia, mortality, technical failure, and complete occlusion.

**Methods:** This is a cross-sectional, retrospective study with non-probabilistic convenience sampling, analyzing 455 patients with ruptured cerebral aneurysms. Of these, 356 had wide-neck aneurysms and 99 had narrow-neck aneurysms. Clinical variables were collected from medical records, including: age at presentation; Hunt-Hess scale to assess subarachnoid hemorrhage severity; aneurysm size, measured in millimeters; modified Rankin Scale to assess functional disability; rate of delayed cerebral ischemia; mortality; technical failure (presence of procedure-related complications); and complete aneurysm occlusion. Statistical analysis was performed using the Chi-square test to compare categorical variables and the Mann-Whitney test to compare continuous variables between groups.

**Results:** The analysis results revealed statistically significant differences between the groups of patients with wide-neck and narrow-neck aneurysms. Patients with wide-neck aneurysms had a mean size of 7.4 mm, while those with narrow-neck aneurysms had a mean size of 6.9 mm ( $p < 0.0004$ ). However, there was no significant difference in terms of age, Hunt-Hess scale, modified Rankin Scale, rate of delayed cerebral ischemia, mortality, technical failure, and complete occlusion between the groups.

**Conclusions:** In this study, we observed a statistically significant difference only in the size of wide-neck aneurysms (larger than narrow-neck ones), but no difference in the functional outcome of these patients. However, further studies are needed to fully understand the relationship between aneurysm neck size, clinical severity, and long-term outcomes.

## Endovascular Neurosurgery

ePoster presentation

A rare case of rebleeding brainstem cavernoma in a 5-month-old-girl

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**Objectives:** The objective of this case study is to present the management and outcomes of brainstem cavernoma (BSC) in a pediatric patient, emphasizing the importance of early intervention and highlighting the associated risks and challenges.

**Background:** Brainstem cavernomas are rare vascular lesions within the intracranial region that can lead to devastating consequences if left untreated. Symptoms and severity vary depending on the size and location of the lesion. Medullary lesions, in particular, often present acutely with cardiorespiratory dysfunction.

**Methods:** We present the case of a 5-month-old child with a brainstem cavernoma. The child initially presented with sudden respiratory distress and excessive salivation. Initial brain magnetic resonance imaging (MRI) revealed a 13 × 12 × 14 mm cavernoma at the pontomedullary junction. After a period of conservative management, the child returned three months later with tetraparesis, bulbar palsy, and severe respiratory distress. Repeat MRI showed an enlargement of the cavernoma to 27 × 28 × 26 mm with evidence of hemorrhage. The patient underwent a complete cavernoma resection using the telovelar approach with neuromonitoring. Postoperatively, the child experienced recovery of motor function, but persistent bulbar syndrome necessitated a tracheostomy. The patient was discharged on day 55.

**Results:** The surgical intervention involving complete cavernoma resection and hematoma evacuation resulted in the recovery of motor function in the pediatric patient. However, the persistence of the bulbar syndrome required additional intervention in the form of a tracheostomy.

**Conclusions:** This case study highlights the rarity and severity of brainstem cavernomas in pediatric patients, emphasizing the significance of early surgical intervention and hematoma evacuation in superficially presenting lesions. While these interventions can be life-saving, the risk of postoperative neurological deficits remains a major concern. Further research is needed to optimize outcomes and minimize complications in pediatric patients with brainstem cavernomas.



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## Skull Base

ePoster presentation

Endoscope–assisted retrosigmoid approach to Meckel’s cave tumors - chances and limits

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**Objectives:** To assess the assumed advantage and feasibility of endoscopic assistance to the retrosigmoid approach.

**Background:** Meckel’s cave lesions represent a technical challenge for adequate exposure and safe removal. The endoscope-assisted technique has shown advantages in the management of Meckel’s cave (MC) tumors through various surgical routes.

**Methods:** A retrospective analysis of all patients undergoing MC tumor resection from 12/2011 to 12/2019 was performed. The radicality and reliability of the primary accomplished microsurgical tumor resection through the retrosigmoid approach was evaluated endoscopically. MC visibility, reachability, and degree of tumor removal through a retrosigmoid endoscope-assisted approach was critically assessed. Follow-up evaluation included the surgical revision rate due to tumor regrowth.

**Results:** A total of 15 MC tumors removed via a retrosigmoid approach were performed (11 female, and 4 male patients; mean age, 60,5 years, age range 39 to 84 years). The most common pathology was meningioma in 80 %. The retrosigmoid approach was considered in 14 cases, as a first-stage surgery, and in one case, as a second-stage surgery. With regard to MC tumor operability, the objective advantage was afforded by the addition of the endoscope. Tumour remnant in MC verified endoscopically, was found in 9 of 15 (60%) final endoscopic explorations. Further resection with complete (4 cases) and partial (5 cases) tumor remnant removal was achieved. No morbidity or mortality related to endoscopic technique occurred. The initial clinical improvement was observed in 12 patients. During the last follow-up, clinical improvement was presented in 10 patients. The mean follow-up was 43 months (range 9-100 months).

**Conclusions:** The endoscope-assisted retrosigmoid approach was feasible for MC tumors with concomitant posterior cranial fossa components. The endoscope-assisted technique helped overcome some of the limitations of the retrosigmoid approach, providing a wider extent and more profound penetration of MC, optimizing surgical radicality, and avoiding second-stage surgery in selected cases.

1603

## Neurovascular Surgery

ePoster presentation

Comparative outcome of intracranial dissecting aneurysms treated by endovascular and surgical treatment following intracranial hemorrhage: an institutional experience

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**Objectives:** The primary objective of this study was to evaluate the clinicoradiological characteristics of intracranial dissecting aneurysms (IDAs) in childhood and assess the treatment outcomes associated with this condition.

**Background:** Intracranial dissecting aneurysm causing intracranial hemorrhage are very uncommon and very few studies available comparing its outcome following endovascular and surgical treatment.

**Methods:** A retrospective analysis was performed on pediatric patients who received treatment for spontaneous IDAs at our institution between January 2019 and December 2023. Detailed examinations of clinical presentation, aneurysm features, treatment modalities, and patient outcomes were conducted.

**Results:** The study involved 25 pediatric patients with IDAs, with a mean age of  $12.4 \pm 4.9$  years (range, 3–15 years), comprising 25% of all treated intracranial aneurysms in pediatric cases during the specified period. Among them, 15 (60%) were male and 10 (40%) were female. The incidence of large ( $\geq 10$  mm) or giant ( $\geq 25$  mm) aneurysms was 40%. Endovascular treatment was administered to 11 (44%) patients, surgical treatment to 9 (36%) patients, and 5 (20%) patients received conservative treatment. Perioperative complications occurred in 2 patients treated with endovascular and 3 patients treated surgically ( $p = 0.21$ ). Out of those treated with endovascular intervention, two patients achieved full recovery with a Glasgow Outcome Scale (GOS) score of 5, and one patient treated surgically recovered with a GOS score of 4. Overall, 22 (88%) patients experienced a favorable outcome, while three (12%) had an unfavorable outcome during a mean follow-up of  $22.32 \pm 7.43$  months (range, 6–55 months).

**Conclusions:** Pediatric IDAs are infrequent occurrences. In this specific series, endovascular management emerged as a relatively safe and effective treatment approach for pediatric IDAs. However, continued follow-up is essential due to the potential risk of aneurysm recurrence and de novo aneurysm formation following treatment.

1605

## Peripheral

ePoster presentation

End-to-side neurorrhaphy techniques: exploring neuronal regeneration for nerve function restoration

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**Objectives:** The objective of this study is to assess the efficacy of end-to-side neurorrhaphy (ETSN) in restoring nerve function and sensory sensitivity in pediatric patients with brachial plexopathy.

**Background:** End-to-side neurorrhaphy, also known as termino-lateral neurorrhaphy, is a reconstructive technique used in the treatment of peripheral nerve injuries. Despite being initially abandoned due to unsatisfactory results, the technique has been reintroduced with advancements in neurobiology and microsurgical techniques. Subsequent studies have demonstrated promising outcomes in nerve regeneration after end-to-side neurorrhaphy. The aim of this study is to report the case of a pediatric patient, a victim of a car accident, with total left brachial plexopathy (with subsequent partial improvement), who underwent neurorrhaphy from the lateral cutaneous nerve to the median nerve in order to restore protective sensitivity in the pinch region.

**Methods:** The information for this study was obtained through patient interviews, medical record review, laboratory test reports, and relevant literature review. Surgical proposal: Neurorrhaphy from the lateral cutaneous nerve as the donor to the median nerve as the recipient was proposed, with the objective of restoring protective sensitivity in the pinch region.

**Results:** The case report presented in this study demonstrates the successful application of ETSN in a pediatric patient with brachial plexopathy. The technique effectively restored protective sensitivity in the pinch region

**Conclusions:** Although the efficacy of ETSN differs from other model techniques, such as neurotization, in many cases, it can be a valid therapeutic option, especially when combined with other strategies or in specific situations. This case and other findings reinforce the importance of considering ETSN as a viable therapeutic alternative for peripheral nerve injuries.

1606

## Neurovascular Surgery

ePoster presentation

Pattern of distribution of Labbé and Trolard's anastomotic veins in relation to laterality and sex: an angiographic study

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**Objectives:** Investigate the pattern of distribution of Labbé and Trolard's anastomotic veins in relation to laterality and sex in cerebral angiography exams of the Brazilian population.

**Background:** The superior (Trolard's) and inferior (Labbé's) anastomotic veins, which connect the middle cerebral vein to the superior sagittal and transverse sinuses, respectively, are important in the field of neurosurgery as they are high-risk veins for injuries during surgical procedures, given their constant accessibility. The literature describes the consequences of involvement of these veins during surgical procedures, including cerebral edema, venous infarction, and hemorrhage, among other complications.

**Methods:** This is a cross-sectional, observational, and retrospective study. Twenty angiography exams were analyzed as an initial quantitative sample. Angiography exams evaluating the venous drainage of the brain were included, while cerebral angiography exams that did not have the three incidences used in the exam were excluded. Descriptive statistics were used for data analysis according to each proposed objective.

**Results:** Labbé's anastomotic vein was more prevalent on the right in females, while it was more prevalent on the left in males. Trolard's anastomotic vein was more prevalent on the right in males, while it was more prevalent on the left in females.

**Conclusions:** This study described the pattern of distribution of Labbé and Trolard's anastomotic veins in relation to laterality and sex, and related the findings to potential complications secondary to iatrogenic venous injury, demonstrating the importance of understanding the anatomy of these vascular structures and their surgical implications.

1607

## Trauma

ePoster presentation

Clinical, physiological and outcome variables in patients with epidural hematomas: analysis of 961 surgical cases

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**Objectives:** This study aims to analyze the clinical, physiological, and outcome variables in patients with epidural hematomas of various etiologies.

**Background:** Epidural hematoma is primarily caused by cranial trauma, occurring in approximately 2.7% to 4% of cases. Despite its prevalence, there are still numerous factors associated with prognosis and mortality that remain unclear.

**Methods:** This is a cross-sectional and retrospective study that employed a non-probabilistic convenience sampling method. A total of 961 patients with epidural hematomas were included. Clinical variables were collected from medical records and encompassed age, gender, mechanism of trauma, presence of associated extracranial trauma, Glasgow Coma Scale at admission, classification of traumatic brain injury (TBI), pupillary abnormalities, focal deficits, presence of associated intracranial trauma, time until surgical admission, surgical complications, clinical complications, and Glasgow Outcome Scale (GOS) scores.

**Results:** No correlation was found between the mechanism of trauma and the type of TBI (mild, moderate, or severe). The mortality rate was 11.84%, with a higher rate observed in the group aged 66 years or older (29.4%) and a lower rate (5.8%) in the group aged 10 to 18 years. Temporal and parietal hematomas, as well as patients with anisocoria/midriasis, had higher mortality rates compared to those with isocoria (36.0% vs. 8.2%). Patients with pupillary abnormalities had a higher rate of bad outcome (GOS 1-3) (47.5% with GOS 1-3 vs. 11.8% in patients without pupillary abnormalities), as did patients with surgical complications (54% with GOS 1-3 vs. 12% in patients without surgical complications), and patients with clinical complications (54% vs. 12% in patients without clinical complications).

**Conclusions:** Several factors have been associated with poor outcomes in epidural hematomas. In our study, the main outcome modifiers were level of consciousness, size of preoperative pupils, age, comorbidities, and associated traumatic injuries.

1608

## Neurovascular Surgery

ePoster presentation

### Morphometric aspects of the middle meningeal artery: a cadaveric study

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**Objectives:** To investigate the Angioarchitecture of the AMM through the measurement of morphometric parameters in Brazilian human skulls.

**Background:** The MMA is the primary vessel responsible for vascularizing the cranial dura mater. Its complex embryological origin and close association with the cranial vault give it clinical and surgical relevance. Understanding the MMA is crucial in procedures like revascularization of dura mater tumors and comprehending clinical conditions like migraine and epidural hematomas. However, there is a lack of information regarding the morphometry of MMA in literature.

**Methods:** This cross-sectional, observational study employed convenient non-probabilistic sampling. Data collection involved using the ImageJ software. Analysis was conducted on 100 human skulls, both articulated and disarticulated, obtained from an anatomical collection. Of these, 30 allowed for complete visualization of the MMA sulcus and were included in the study. Bilateral analysis covered the length of the main trunk, frontal and parietal branch lengths, interbranch angle, and diameter of the spinous foramen.

**Results:** No differences were found in the main trunk length (right: 14.58mm ± 9.52mm, left: 16.01mm ± 12.18mm, p=0.870) or the parietal branch length (right: 28.98mm ± 17.89mm, left: 30.38mm ± 17.24mm, p=0.743). However, the left frontal branch was significantly larger than the right (29.89mm ± 12.77mm vs. 26.83mm ± 16.67mm, p=0.011). There were no differences in the diameter of the spinous foramen (right: 2.14mm ± 0.40mm, left: 2.15mm ± 0.44mm, p=0.771) or the angle between the frontal and parietal branches (right: 89.66° ± 16.83°, left: 85.91° ± 24.64°, p=0.700).

**Conclusions:** This study provides morphometric data on the MMA, which can be utilized in surgical planning and serve as a basis for future analyses.

1609

## Neurovascular Surgery

ePoster presentation

Management of spinal dural arteriovenous fistulas: review of 2 cases

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**Objectives:** Describe a rare pathology through 2 cases and review the literature.

**Background:** Spinal dural arteriovenous fistula represents only 5 to 9% of central nervous system vascular malformations.

**Methods:** We present a series of 2 cases.

**Results:** Case 1: 52-year-old patient admitted for a progressive spinal cord compression syndrome. A spine MRI revealed edema in the spinal cord conus up to T8 and the existence of abnormal perimedullary vessels. A spinal cord angiography confirmed the presence of a dural fistula at T9 level on the left. A section of the fistula was made with good postoperative evolution.

Case 2: 60-year-old patient who presented with thoracic spinal cord compression syndrome evolving for 6 months. Complementary examinations (MRI and medullary angiography) made it possible to conclude that there was a spinal dural fistula at the level of T7 on the left. The fistula was excluded by surgical section of the fistula. The postoperative evolution was good.

**Conclusions:** The diagnosis is strongly suspected on MRI, confirmation is given by angiography.

1612

## Spine

ePoster presentation

Thoracolumbar spine lesions treated through an anterolateral approach: preliminary results in a series of 55 cases

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**Objectives:** Evaluate the feasibility of an anterolateral surgical approach of the thoracolumbar spine in a context of limited resources.

**Background:** While the benefits of the anterolateral approach have already been demonstrated, its use is rarely possible due to cost-prohibitive equipments and implants in low and middle-income countries.

**Methods:** A prospective study performed at the Regional Hospital Center of Thiès in Senegal from June 2020. We included all patients operated through an anterolateral approach for a thoracolumbar lesion. The variables analyzed included demographic data, neurological and radiological assessment, surgical management and outcome. The follow-up was 12 months.

**Results:** A total of 55 patients were included. The mean age was  $35 \pm 13$  years and the majority were male (85.5%). The most frequent etiology was traumatism (61.8%) followed by Pott's disease (27.2%). Forty four percent (44%) patients had a neurological deficit on admission. Most lesions were located at the thoracolumbar junction (69.1%). The anterior-posterior approach was used in 91% cases and a pulmonary exclusion was needed in 4 cases. A titanium mesh cage with bone graft was used in 89.1%. There was a neurological improvement in 41% cases. At 12 months follow-up, the mean postoperative kyphotic Cobb's angle was  $8.88 \pm 2.95^\circ$  ( $p < 0.05$ ), 76% patients presented a complete bone fusion and 74.7% patients had no disability when evaluated with the Oswestry Disability Index.

**Conclusions:** These results show that we can achieve more with less. Although we encounter many challenges, this procedure is feasible with satisfactory outcomes in a limited resources setting. The next step will be to set up a decisional algorithm for anterior approach indications, taking in consideration our field realities.



1613

## Oncology

ePoster presentation

Intraoperative ultrasound a guidance for resection of lesions and tumors in brain and spine and adaptation of the intracavitary probe

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**Objectives:** 1. To demonstrate the usefulness of ultrasound with intracavitary probe as a real-time tool to guide the resection of tumors or intracerebral or intraspinal lesions from the beginning to the end of the surgery, 2. To demonstrate practical ways of training and how to acquire the skills for the proper use of diagnostic ultrasound in intraoperative neurosurgery.

3. Compare Diagnostic Magnetic Resonance Imaging with intraoperative Ultrasound findings.

**Background:** The use of real-time intraoperative imaging in neurosurgery is desirable in many conditions. Intraoperative Magnetic Resonance Imaging (MRI) excels in providing great detail but at a very high cost.

We have used ultrasound with intracavitary probe (used in gynecology and obstetrics) relatively low cost tool to define in real time lesions in brain and spine.

**Methods:** In 2017 we started regular ultrasound practice in brain tumor resection after a practical course with radiologists and neurosurgeon expert in ultrasound. Data were collected in imaging cases since 2017 using a protocol of use that has been modified to adapt the use of intracavitary probe in almost all surgeries. of. brain tumors and other types of lesions , even when the neuronavigation is not available.

**Results:** We have found great confidence with the use of intraoperative ultrasound, at different stages in the course of cranial and spinal surgery mainly in resection of brain tumors.

**Conclusions:** An intracavitary probe (used in obstetrics and gynecology) is a diagnostic ultrasound system, easy to find in many operating rooms around the world, which is very useful in neurosurgery because of its size, versatility, precision, in superficial and deep lesions, which can guide procedures such as biopsies, resection of lesions, evacuation of collections, in cranial and spinal surgery, from the beginning even to plan or modify the size of a craniotomy until the end to check the extent of the resection.

1614

## Trauma

ePoster presentation

### A hunting arrow traumatism to the head: two cases from Niger

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**Objectives:** Share our experience with the successful management of two patients with head trauma using arrow.

**Background:** Head injuries caused by hunting arrows are rarely described; the area most affected by arrows and other bladed weapons in general is the orbital region; transorbital head injuries are rare, accounting for 0.04% of all head injuries; we present two cases of head injuries caused by a handcrafted metal hunting arrow and review the literature.

**Methods:** We describe the cases of two patients who suffered cranial trauma caused by a handmade metal hunting arrow. Both patients came from the same region of Niger called Diffa, located 1200 km from our center in Niamey, an area where several civil conflicts have taken place. The first patient, 20 years old, had an arrow lodged in the right suborbital region, following an intracranial path to the right sylvian valley without damaging any neurovascular structures in its path. The second patient, 42 years old, had an arrow lodged in the left supraorbital region, following an extracranial path to the contralateral orbit. Both patients underwent successful surgery and have been followed up to date without any particulate damage.

**Results:** Both patients underwent successful surgery and have been followed up to date without any particulate damage

**Conclusions:** Cranial trauma from hunting arrows is extremely rare. Medical imaging is necessary for lesion assessment and surgical planning. Prognosis depends on the trajectory of the arrow with or without damage to neurovascular structures.

1615

## Paediatric

ePoster presentation

Firearm injuries among children due to the Kivu conflict from 2017 to 2020: a hospital-based retrospective descriptive cohort study

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**Objectives:** This study aimed to quantify the burden of F&NFFIs in the Eastern DRC and identify predictors of mortality. Understanding the nature, characteristics, and survival patterns of firearm injuries among children.

**Background:** Firearm-related injuries are deadly but avoidable. The case of Kivu, a region in the Eastern Democratic Republic of Congo (DRC), is alarming. Decades of unresolved regional conflicts birthed armed groups that have massacred inhabitants and injured several children. This regional instability has also created barriers to seeking and obtaining timely care, decreasing the survival rate. This region's lack of data on paediatric fatal and nonfatal firearm injuries (F&NFFIs) needs studying.

**Methods:** We included all F&NFFI paediatric patients ( $\leq 18$  years), admitted at our institution between 2017 and 2020. We extracted data from patient records. Next, we assessed the relationship between determinants of paediatric outcomes using the Chi-square test and the student's t-test. Confounders were identified using cox regression.

**Results:** This study included 101 paediatric patients, mostly male (63.4%), with an average age of 15.9 years residing 164.4 km on average from the hospital. On average, they were admitted 2.9 days post-injury, with the most affected anatomical regions being lower limbs (53.5%) and upper limbs (18.8%). The mean length of stay was 52.9 days, and the mortality rate was 4.0%. Also, injury complications increased the mean length of stay and mortality rate. In addition, mortality was correlated with circulatory failure and anaemia.

**Conclusions:** Paediatric F&NFFIs in Eastern DRC is a preventable tragedy. Mortality is increased by injury complications and correlates with some biological factors. Prevention strategies should be developed to protect children and appropriate measures should be established to improve rates of prehospital care and early hospital presentation to lower mortality and improve paediatric outcomes.

1616

## Oncology

ePoster presentation

Esthesioneuroblastoma diagnostic and therapeutic difficulties: a case report from the University Hospital of Guadeloupe

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### Objectives:

- Report a case of esthesioneuroblastoma
- Review the literature on this rare tumor

**Background:** An esthesioneuroblastoma or olfactory neuroblastoma is a rare nasosinusal tract tumor developed at the expense of the olfactory neuroepithelium, the first case of which was described in the literature in 1924 by Berger et al. The management of this tumor is reserved for experienced surgical teams and no recommendations are available, the experience of each center being limited due to the rarity of this tumor.

In this article, we report on our experience in one case.

**Methods:** Case report and literature review.

**Results:** A 65-year-old man was brought to the emergency room for a seizure with post-critical coma in whom the history revealed a frontal syndrome associated with helmet headaches and hallucinations. MRI ruled out an abscess and suggested ethmoidal carcinoma or an esthesioneuroblastoma. He was treated surgically by a mixed neurosurgery-otorhinolaryngology team. Anatomopathology concluded the diagnosis of high-grade olfactory neuroblastoma difficult to grade III or IV. The removal was complete and followed by radiochemotherapy according to the STUPP protocol. The clinical evolution of the patient postoperatively is favorable although vertigo persists.

**Conclusions:** An esthesioneuroblastoma is a rare tumor with mostly poor symptomatology even in cases of extensive intracranial invasion. Treatment is based essentially on the most complete surgery possible followed by radiochemotherapy.

1617

## Spine

ePoster presentation

Spontaneous spinal subdural hematoma post lumbar puncture responsible for a syndrome of the tail of horse and review of literature

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### Objectives:

- Report a case of spontaneous spinal subdural hematoma post lumbar puncture
- Review the literature about this rare case

**Background:** Spinal subdural hematomas (SDH), even rarer than epidural ones, are serious and responsible for permanent neurological deficits without adequate treatment. In this presentation, we report on a spontaneous cauda equina syndrome case after a young patient's lumbar puncture without anticoagulant treatment or blood crase disorder.

**Methods:** Case report and literature review.

**Results:** A 19-year-old male patient who underwent two lumbar punctures 4 days apart, as part of a work-up for fever and dizziness, presented with genital-sphincter disorders. He was no ongoing anticoagulant treatment or blood crase disorder. Clinical examination revealed neurological damage below the S1 root: a bladder globe requiring bladder catheterization, abolition of erection for 48 hours; hypoesthesia in the stool with hypotonia of the anal sphincter on rectal touch. No motor involvement from L2 to S1, flexion, and extension of the toes was preserved. The clinical diagnosis of cauda equina syndrome was evoked. MRI revealed an S1-S2 subdural hematoma. An S1-S2 laminectomy with the evacuation of the hematoma was recommended. The evolution was marked by a complete recovery of genito-sphincter disorders and sensitivity disturbances at 6 months.

**Conclusions:** Subdural spinal hematoma is a rare but serious pathology, as it can be responsible for neurological deficits that are sometimes permanent, although rarely very compressive. It often occurs in subjects on anticoagulants or with coagulopathy, although cases without an obvious cause have been reported, as in this patient's case. Management is medical-surgical.

1618

## Global Neurosurgery

ePoster presentation

Vulnerability of African neurosurgery to predatory journals: an electronic survey of aspiring neurosurgeons, residents and consultants

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**Objectives:** The aim of this study was to evaluate the vulnerability of African neurosurgery researchers to PJs and identify their correlates.

**Background:** Predatory journals (PJs) publish research with little to no rigorous peer review in exchange for money. It is unclear what proportion of researchers is vulnerable to PJs and which factors are associated with vulnerability.

**Methods:** A 3-part electronic survey in English and French versions was distributed via social media to African consultants and trainees from November 1 to December 1, 2021. Bivariable relationships were evaluated with  $\chi^2$  test, Mann-Whitney U test, Spearman  $\rho$  correlation, odds ratios, and 95% confidence intervals. A P value < 0.05 was considered statistically significant.

**Results:** There were 101 respondents to the survey (response rate 56.1%). Respondents had mean age of 34.9 years, 82.2% were male (n = 83), 38.6% were consultant neurosurgeons (n = 39), and 33.7% were from Central Africa (n = 34). Of respondents, 66 had published  $\geq 1$  articles in the past, and 13 had published at least 1 article in a PJ. A PJ had contacted 34 respondents via e-mail, and 8 respondents had reviewed articles for a PJ. The Think. Check. Submit initiative and Beall's list were familiar to 19 and 13 respondents, respectively. Publication in PJs was correlated with the respondent's age (R = 0.23, P = 0.02) and total scholarly output (R = 0.38, P < 0.01).

**Conclusions:** Young African neurosurgery researchers are vulnerable to PJs primarily because they are not familiar with the concept of PJs or how to identify them.

1619

## Oncology

ePoster presentation

### Ticking circadian clock and gliomas

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**Objectives:** To study how circadian clock affects glioma pathophysiology.

**Background:** Dysregulated circadian clock gene expression can affect glioma progression by affecting tumour immune landscape and cell cycle and is a potential predictive biomarker in glioma as well as a potential treatment target.

**Methods:** Literature review.

**Results:** Dysregulated circadian clock gene expression can affect glioma progression by affecting tumour immune landscape and cell cycle. Circadian rhythms modulate cellular functions via a transcriptional-translational feedback loop (TTFL) comprised of core clock genes transcriptional activators CLOCK, and ARNTL and transcriptional repressors PER1/2/3 and CRY1/2. In the suprachiasmatic nucleus the PER gene expression is synchronized and stimulated by light. PER and CRY proteins, once transcribed, are translocated into the nucleus to interact with CLOCK and ARNTL, which then suppress the expression of PER and CRY. Analysis of 32 subjects revealed PERs and CRYs along with several other clock genes are downregulated in gliomas. KL001 is the first CRY modulator that activates both CRY1 and CRY2. Moreover, computational models based on cell cycle states or those based on the dynamics transcriptional/translational clock networks and of relevant drug-related metabolic pathways, and clinical studies showed that the timed drug administration impacts normal and tumour cells differently according to their internal circadian clock. Disparity is because clock and clock-regulated genes in tumour cells frequently have different circadian profiles or even different period lengths thus highlighting the importance of chronotherapy. Clinical and experimental studies showed that melatonin that helps regulate the circadian rhythm synchronize the sleep-wake cycle with night and day enhance the antineoplastic activity of chemotherapy.

**Conclusions:** Importance of Circadian Rhythm in Gliomagenesis should be explored to assess risk of gliomagenesis, treatment targets as well as chronotherapy. It also paves way into a possible biomarker to assess treatment response and tumor recurrence.

1621

## Education, Ethics, Socioeconomic

ePoster presentation

### Gender differences in electronic health record usage among surgeons

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**Objectives:** Investigate gender differences in EHR use among surgeons.

**Background:** Previous work suggests female physicians in non-surgical specialties spend more time interacting with EHR compared to males. Differences in EHR use among surgeons has not been assessed.

**Methods:**

Retrospective study, single academic hospital investigated EHR use by surgeons in January 2023. EHR usage data were retrieved from Signal (Epic Systems). Data were collected on provider demographics (gender, specialty, time in practice), patient characteristics (age, problem list), note length, and time (chart, note). Univariate and multivariate regression analysis was performed.

**Results:**

224 surgeons from 14 specialties were included; 30%(n=68) were female. Providers had a median of 14 years in practice. 28.2%(n=44) and 37.8%(n=59) of male surgeons held an Associate Professor or Professor appointment compared to 19.1%(n=13) and 27.9%(n=19) of females, respectively. Female surgeons had fewer total number of appointments (57.8 vs. 78.3 patients, p<0.05), spent more time per note on EHR (4.8 vs. 2.5 minutes, p<0.05), and completed fewer charts (29.1 vs. 43.0, p<0.01) over the course of the month. Female surgeons had 40% increased mean progress note length (6,025 vs. 4,308 characters, p<0.01) and 42% document length (6,321 vs. 4,445 characters, p<0.01) compared to males. Female surgeons wrote a greater fraction of their notes manually (17% vs. 12%, p<0.01). Despite seeing 42% of the patient appointments and completing 40% of the charts, females spent equal time in EHR over the course of each month and more time outside of 7am-7pm (36.4 vs. 14.1 min, p<0.05). After controlling for years in practice in multivariate regression, males completed statistically significantly more hospital charts (p<0.01) and wrote shorter progress and documentation notes (p<0.01) compared to females.

**Conclusions:** Our results demonstrate significant gender differences in EHR usage among surgeons, even after controlling for years in practice. These differential burdens may partially contribute to higher burnout rates that have been reported in female surgeons.



1622

## Spine

ePoster presentation

### Spinal column shortening in treating tethered cord syndrome

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**Objectives:** To study the safety and effectiveness of Spinal column shortening in treating tethered cord syndrome.

**Background:** The clinical manifestations of tethered cord syndrome (TCS) often originate from the stretching of the end of the spinal cord. The traditional surgical treatment method is filum terminale release, but the incidence of cerebrospinal fluid leakage, nerve injury and other complications is high, and the recurrence rate of symptoms after release reaches 50-100%. Grande et al. reported in 2006 that spinal shortening performed on gross specimens reduced spinal cord and nerve root tension.

**Methods:** We prospectively enrolled 13 patients with recent aggravation of neurological dysfunction due to thickened filum terminale, myelolipoma, myelomeningocele, arachnoid adhesions, etc., and had undergone at least one posterior surgery. We all chose T12 or L1 for parallel osteotomy through the pedicle. After osteotomy, the bone surface was compressed and closed, and two segments were fixed at the upper and lower levels, and autologous bone was implanted laterally. Surgical complications, preoperative and postoperative changes in neurological function, and quality of life scores were observed.

**Results:** The spinal column was shortened by 13.3 (11.7-14.8) mm. At the last follow-up, no implant displacement, loosening, or adjacent spondylosis was found. Among the 9 patients with decreased muscle strength before operation, 5 patients complained of improvement in motor function; 2 of 3 patients with leg pain improved; of 7 patients with preoperative sensory system disturbances (including pain, numbness), 6 cases complained that the symptoms were improved compared with preoperative; among the 8 patients with diuresis disorder, 4 cases improved. The average VAS score of all patients decreased from 5.1 to 2.1; the ODI score decreased from 44.2% to 21.0%.

**Conclusions:** Spinal column shortening is the surgical procedure of choice for patients with recurrent tethered cord syndrome who have undergone posterior surgery. This study preliminarily confirmed its safety and effectiveness.

1623

## Spine

ePoster presentation

Development of a novel low-cost exoscope to expand access to microneurosurgical care in low- and middle-income countries

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**Objectives:** To present an affordable and simplified exoscopic viewing system for low-resource settings. It represents an alternative within the systems used in microneurosurgery.

**Background:** Less than a quarter of the world population has access to microneurosurgical care within a range of 2 hours. We introduce a simplified exoscope system to achieve magnification, illumination, and video recording in low-resource settings.

**Methods:** We combined an industrial microscope tube a heavy-duty support arm, a wide-field c-mount digital microscope camera, and a light-emitting diode ring light. All parts were sterilized with ethylene oxide. we performed 13 spinal and 3 cranial surgeries with the help of the low-budget exoscope.

**Results:** The average preoperative setup time was 12.8 minutes. The exoscope provided similar magnification and illumination like a conventional binocular microscope. It allowed operating in a comfortable posture. The field of vision ranged from 30 mm to 60 mm. The surgical field was captured by a 16-megapixel two dimensional camera and projected on a 55-inch high definition television screen in real time. Image quality was similar to that of a conventional microscope although our exoscope lacked stereoscopic view. Adjusting camera position and angle was time-consuming. Thus, the benefit of the exoscope was most notable in spine surgeries where the camera remained static or most of the time. The total cost of the exoscope was approximately U.S. \$ 750.

**Conclusions:** Our low-budget exoscope offers similar image quality, magnification, and illumination like a conventional binocular microscope. It may thus help expand access to neurosurgical care worldwide. Users may face difficulty adapting to the lack of depth perception in the beginning. Prospective studies are needed to assess its usability and effectiveness compared to the microscope.

1624

## Paediatric

ePoster presentation

### CNS Ewing's sarcoma in children - a largest institutional study

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**Objectives:** To determine the surgical outcome of children with Central nervous system (CNS) Ewing's sarcoma followed.

**Background:** Ewing's sarcoma occur most often in bone and soft tissues of children and young adults. The intracranial and spinal manifestation of the disease is rare and reported incidence being less than 6 %.

**Methods:** This is a retrospective analysis of 13 patients of CNS Ewing's sarcoma who reported to the department of neurosurgery NIMS between 2014-2016. All cases after detailed examination, MRI and CT scan were subjected to surgery followed by adjuvant therapy comprising of chemotherapy and radiotherapy. Outcome was analysed at 6 months to 1 year follow up.

**Results:** There were 8 females and 5 males with a mean age of 12 years (ranging from 4–18 years). Pain was the common presenting feature in all cases. Focal neurological deficits corresponding to the anatomical location was seen in 6 patients. These thirteen cases were distributed anatomically as 4 cases involving the clivus, 2 cases with occipital lobe involvement, one case of parietal lobe involvement and 6 cases of spinal involvement. Surgery was performed in all cases, gross total excision (7), near total excision (3) and subtotal excision (3) was achieved in these 13 cases. Subsequently all cases underwent multiagent chemo-radiotherapy. Post surgery pain subsided in 12 (92%) of patients. Ten patients maintained or improved motor function. In 7 cranial cases and in 6 spinal cases 4 cases showed improvement. While 3 (23%) had deterioration of motor function. During follow up (mean 9 months) 38% had disease free interval. Seven patients (53%) developed metastatic disease. Three (23%) patients developed a local recurrence. On evaluation post op follow up 4 cases were found to have other focus of recurrence.

**Conclusions:** Surgical outcome of Ewing's sarcoma in short term follow-up is good with current recommended management regime of chemo and radiotherapy. However metastasis is not uncommon.

1627

## Spine

ePoster presentation

### Ossification of posterior longitudinal ligament and fluorosis

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**Objectives:** OPLL is a progressive disease that causes spinal canal compromise and serious neurological sequelae in advanced cases. The incidence of OPLL in Asiatic population is 2-3 %. Our aim is to study the association of OPLL with fluorosis by comparing urine fluoride levels and to study the types of OPLL.

**Background:** OPLL is a progressive disease that causes spinal canal compromise and serious neurological sequelae in advanced cases<sup>4</sup>. A disease of Asiatic population with prevalence of 2 -3%<sup>8,27</sup> is significantly different from cervical spondylotic myelopathy, a disease more common in non- Asians<sup>26</sup>.

**Methods:** 30 consecutive patients with OPLL in cervical skiagram, confirmed by CT cervical spine underwent 24-hour urine fluoride level assessment by Ion – Selective Electrode method. Thirty patients with normal cervical skiagram were taken as a control group and their 24-hour urine fluoride levels were compared with the test group. 24-hour urine fluoride level above 1.6mg/L was taken as diagnostic of fluorosis. Imaging analysis of study group focused on the subtype of OPLL, mass occupying ratio, sagittal cervical angle, signs of dural penetration and spinal levels involved. Urinary fluoride levels were correlated with the presence of OPLL as well as different types of OPLL.

**Results:** Of the 30 patients with OPLL, 25 were males and 5 were females. 24-hour urinary fluoride levels varied in the range of 0.26mg/L to 12.2 mg/L. 18 (60%) patients in the study group were found to have levels above 1.6mg/L and only 1 patient (4%) of the control group had had urine fluoride level > 1.6mg/L and the difference was statistically significant. Patients with a continuous and mixed type of OPLL had higher mean fluoride levels than segmental and focal type.

**Conclusions:** Fluorosis is associated with a higher incidence of OPLL. Higher urinary fluoride levels correlate with severe forms of OPLL.

1629

## Trauma

ePoster presentation

Growing fracture: management of a case in Niger and review of the literature

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**Objectives:** Report the case and review the literature, and discuss the management plan.

**Background:** Growing fractures are a very rare but dreaded complication of growing skull fractures. To our knowledge, very few cases have been reported in the literature.

**Methods:** case report.

**Results:** The authors report the case of a 15-month-old child who suffered a head injury with initial loss of consciousness at the age of one month following a blow with a piece of iron. After 14 months, clinical examination revealed a pulsatile right frontoparietal curvature and left hemiplegia. Cerebral CT and MRI scans led to the diagnosis of a growing fracture. The child underwent surgery to close the dural breach. The postoperative course was straightforward, with the recovery of the neurological deficit.

**Conclusions:** Growing fractures are rarely reported in the literature, but complications can be serious, hence the need to monitor fractures in growing skulls.

1632

## Peripheral

ePoster presentation

Electrospun polylactic acid/polyvinylpyrrolidone conduit combined with mesenchymal stem cells to promote functional nerve regeneration in rat sciatic nerve injury model

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**Objectives:** The aim of this study was to investigate the effect of using an artificial neural graft produced with polylactic acid (PLA) and polyvinylpyrrolidone (PVP) by electrospinning method in combination with rat allogeneic adipose tissue-derived mesenchymal stem cells (rAT-MSCs) on axonal regeneration in rat sciatic nerve injury.

**Background:** A 10 mm long nerve gap was created in Sprague Dawley rats which were divided into three groups: the gap was repaired with autologous nerve graft (autograft group), PLA/PVP conduit graft, and PLA/PVP with rAT-MSCs conduit graft.

**Methods:** Results were evaluated functionally, electrophysiologically and histologically.

**Results:** In functional evaluation sciatic functional index (SFI) was used and all groups showed improvement over time. The best results were seen in the autograft, and PLA/PVP with rAT-MSCs conduit graft groups with no statistically significant difference between them. In electrophysiological evaluation, action potential was seen in all three groups, with the best results seen in the PLA/PVP with rAT-MSCs conduit graft group with statistically significant difference between them. Histological evaluation showed axonal regeneration in all three groups.

		Axon count/defect area	Average myelin thickness
<b>Autograft</b>	Median	50.49	1.02
	Minimum	42.05	0.90
	Maximum	64.53	1.13
<b>PLA/PVP conduit</b>	Median	21.15	0.83
	Minimum	18.07	0.73
	Maximum	26.78	0.98
<b>PLA/PVP conduit with rAT-MSCs</b>	Median	26.7	1.08
	Minimum	23.25	1.02
	Maximum	28.77	1.17
<b>Kruskal–Wallis test</b>		p<0.05	p<0.05

Descriptive data on axon count/defect area and average myelin thickness of three groups (micrometre for average myelin thickness).

**Conclusions:**

The study is obvious that PLA/PVP conduit graft contributes to regeneration even when used alone, and increases regeneration when used together with rAT-MSC.

1636

## Trauma

ePoster presentation

### Surgical management of traumatic spinal injuries in Sylvanus Olympio Teaching Hospital

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**Objectives:** To describe the pattern and the surgical management of patients with traumatic spine injury in Lomé, Togo.

**Background:** Neurosurgery has been developed in Togo since 2008. However, stabilization techniques and time to surgery for TSI are not reported in Togo.

**Methods:** We conducted a retrospective and descriptive from November 2017 to October 2020. We included adult patients who presented with traumatic spine injury and who underwent surgery stabilization.

**Results:** A total of 93 patients were studied. The population was young ( $35.92 \pm 9.68$  years old), men (91.4%). Road traffic accidents accounted for 85% of patients. At presentation, 59.1% of patients had an incomplete neurologic deficit (ASIA B-D). The cervical spine was the most common segment injured (57%). The median time from admission to the operating room was  $21.06 \pm 11.8$  days. After surgery, 15.3% improved by at least 1 ASIA grade. Bedsores (14%) and superficial wound infection (10.8%) were the most typical complications in our series after surgery.

**Conclusions:** Traumatic spinal injury in Lomé mainly occurred in young adult males. It is affecting mainly the cervical spine. Despite limitations in medical resources, spine surgery appears promising in our country.



## Education, Ethics, Socioeconomic

ePoster presentation

Current generational differences among women practicing neurosurgery versus trainees in neurosurgery: scholarly productivity and social media influence

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**Objectives:** Investigate potential generational gaps in academic productivity and social media utilization amongst women practicing neurosurgery versus trainees.

**Background:**

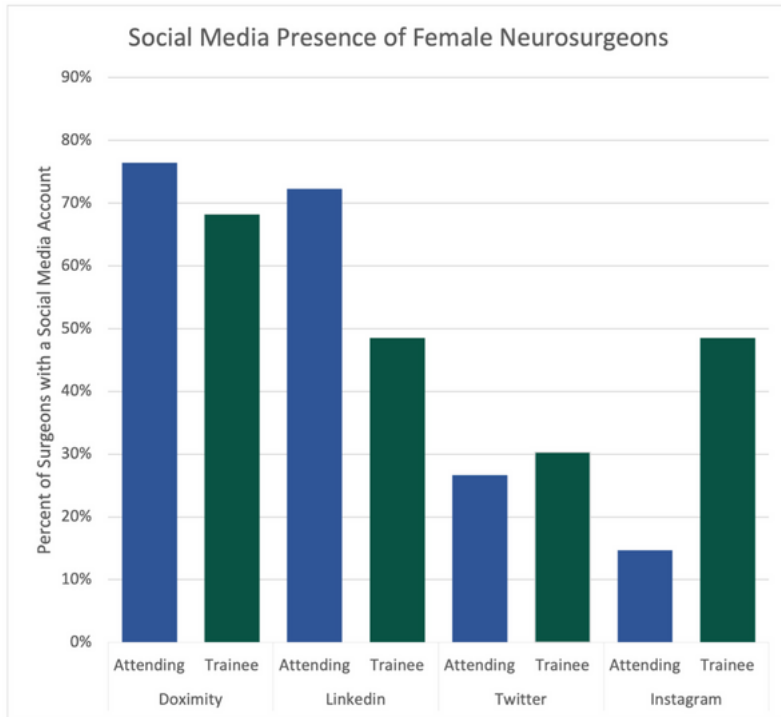
The use of social media continues to rise in medicine as a tool to disseminate knowledge, discuss research, promote awareness and advocate for neurosurgical patients and causes. We hypothesize there is a higher rate of social media use amongst the generation of technology-forward trainees in the post-COVID era.

**Methods:**

Utilizing a membership list from Women in Neurosurgery (WINS, April 2023), data including degrees/training, H-index, publications, NIH funding, and public social media was collected.

**Results:**

A total of 257 women were included, 191 attending neurosurgeons and 66 trainees. Twenty-one trainees (32%) are post-graduate fellows (52% pediatrics, 24% endovascular/cerebrovascular, 24% skull base). Average H-index for practicing neurosurgeons was  $16.1 \pm 1.7$ ,  $9.5 \pm 3.3$  for trainees. H-index normalized for years from medical school for attending neurosurgeons was  $0.64 \pm 0.04$  and  $0.95 \pm 0.09$  for trainees, with a mean difference of 0.31 [CI 0.13, 0.50]. Pearson correlation coefficient (r) between H-index and followers on Twitter, Doximity, and Linked in were 0.53 ( $p < 0.01$ ), 0.22 ( $p = 0.01$ ), 0.2 ( $p = 0.02$ ) respectively. No correlation was found for NIH funding and attendings. For trainees, there was a positive trend between NIH funding and Twitter followers ( $r = 0.69, p = 0.056$  not statistically significant), and a positive trend in correlation between H-index and social media followers (not statistically significant).



**Conclusions:**

Current trainees have a higher normalized H-index compared to attending neurosurgeons and engage more frequently with Instagram. There is no significant correlation of academic productivity markers and social media influence for current trainees, unlike the positive correlation between social media followers and H-index for attending neurosurgeons.

1644

## Oncology

ePoster presentation

Ependymoblastoma in a child and successful treatment with supra-total resection, radiotherapy and chemotherapy: case report

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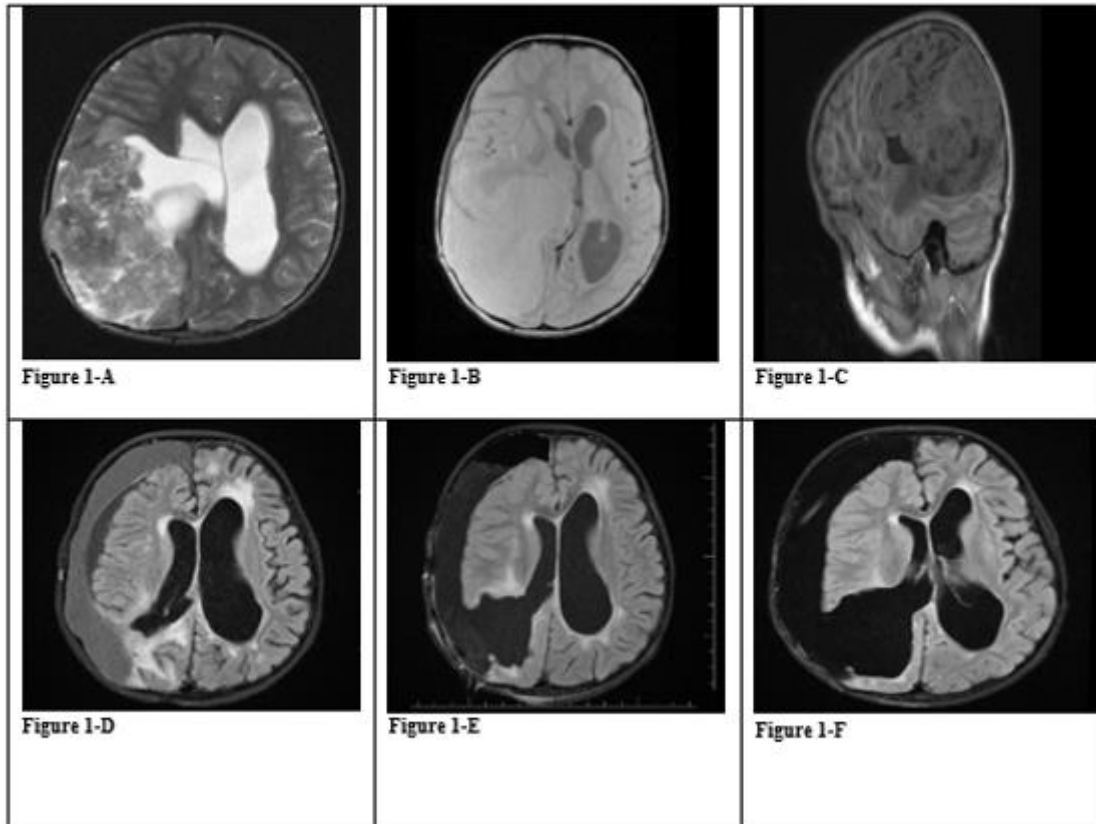
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**Objectives:** In this article, we report an ependymoblastoma case and its successful treatment.

**Background:** Ependymoblastoma is a very rare malign CNS tumor of childhood. Knowledge about clinical characteristics, prognosis and treatment is still insufficient. According to the rarity of the disease, there are limited data about efficient treatment strategies.

**Methods:** A 7-year-old female patient revealed an 8 x 5.3 x 5.6 cm solid-cystic mass in the right parietooccipital region on brain MRI. The solid mass was isointense on T1-weighted images and slightly hyperintense on T2-weighted images, and peri-tumoral edema was observed (Figure 1-A-B-C). Subtotal tumor resection was applied to the patient whose histological examination showed uniform neuroectodermal cells, ependymoblastic rosettes that are different from the mature ependymal rosettes, perivascular pseudo-rosettes within fields of undifferentiated cells. According to pathology result ependymoblastoma (WHO grade IV) was diagnosed.

Figure 1: Magnetic resonance images of the patient



**Figure 1-A: Diagnosis. Figure 1-B: Diagnosis. Figure 1-C: Diagnosis. Figure 1-D: After radiotherapy. Figure 1-E: Six months after treatment. Figure 1-F: Nine months after treatment**

**Results:** Weekly vincristine 1.5 mg / m<sup>2</sup> was received with radiotherapy. There were stable findings in the size of the mass in the control MR imaging after radiotherapy (Figure 1-D). Chemotherapy was started 15 days after the end of radiotherapy. According to chemotherapy plan, cisplatin 75 mg/m<sup>2</sup> x 3, cyclophosphamide 1 g/m<sup>2</sup> x 3, vincristine 1.5 mg/m<sup>2</sup> x 3 alternately etoposide 200 mg/m<sup>2</sup> x 3, carboplatin 500 mg/m<sup>2</sup> x 3 were received a total of six cycles with an interval of three weeks.<sup>1</sup>

The excision of the residual mass was planned two weeks after the 63rd day chemotherapy. No recurrence-residual mass was detected in cranial MRI in the first month after chemotherapy (Figure 1-D). No recurrence-residual mass was observed in the MRI controls performed at the sixth and ninth months after treatment (Figure 1-E-F).

**Conclusions:** We think that supra-total resection, radiotherapy and chemotherapy scheme we applied are successful in the treatment of endymoblastoma.

1648

## Functional

Oral presentation

Posterior superior insula deep brain stimulation for peripheral neuropathic pain: effects and influence of the target

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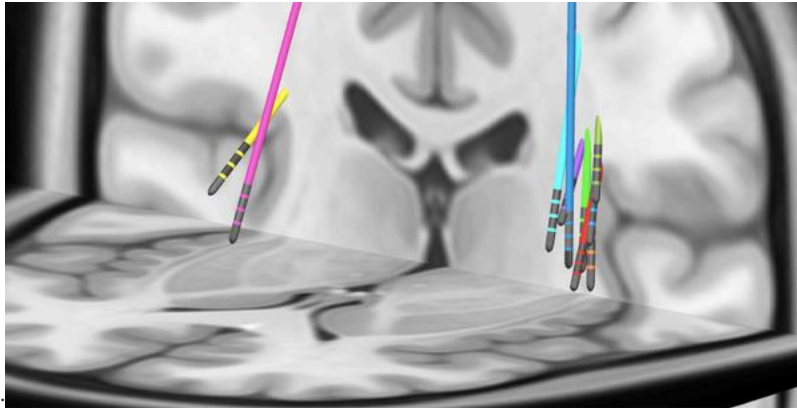
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**Objectives:** Analysis of data from a phase-II trial of posterior superior insula (PSI) deep brain stimulation (DBS) for pain treatment, its effectiveness and target implications.

**Background:** Neuropathic pain (NeP) affects up to 7% of the population, with refractoriness to treatments greater than 50%. Thus, interest in neuromodulation has grown, and new targets are sought. PSI repeated transcranial magnetic stimulation (rTMS) produced pain relief in patients with refractory NeP, which led to the performance of PSI-DBS.

**Methods:** Ten patients with refractory peripheral NeP, responders to PSI rTMS in a previous study were enrolled in a randomized double-blind, sham-controlled, crossover trial. A unilateral electrode was implanted in the PSI contralateral to the side of pain. Patients were randomized to active DBS or sham for three more three months in a cross fashion, and additional three-month single blinded more six-month open-label stimulation. Primary outcome was more than 30% of pain reduction. Quality of life, adverse events, cognitive and psychiatric symptoms were also assessed. Targets coordinates were verified in the probability map of the insula and participants average MNI152 coordinates were compared.

**Results:** Ten patients were submitted to PSI-DBS and completed the study. Bayesian analysis showed that probability of active PSI-DBS decrease pain  $\geq 30\%$  was 82.3% in first six months. The probability to improve physical and mental health after six months was 47.8% and 73.6%, respectively. All targets' coordinates were inside the interval of the anterior long gyrus of insula, with no difference between responders and non-responders. The hot-spot coordinates were  $\pm 33.6$  for X,  $-16.2$  for Y and  $10.9$  for Z.



Electrodes scenario:

**Conclusions:** This pilot trial suggests that PSI-DBS may reduce refractory peripheral neuropathic pain, in addition to be viable and safe, granting larger trials. If the target remains inside anterior long gyrus, response is feasible.

1650

## Functional

ePoster presentation

### Assessment of the first 3 years stereotactic activities in the surgery of brain lesions in Mali

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**Objectives:** To present our experience in the first years of practice of this surgical procedure.

**Background:** Stereotaxic surgery is an image-guided neurosurgical procedure in which a three-dimensional guidance system is used to perform a diagnostic or therapeutic gesture in the brain. This work presents our experience in the 3 first years of practice of this surgical procedure.

**Methods:** We carried out a retrospective, descriptive study of all the files of patients operated on by stereotaxy at the Teaching hospital "Hôpital du Mali" in Bamako, from December 2019 to March 2023. Fifty-six patients were included in the study. Forty-four patients (78.57%) were operated for evacuation of spontaneous intraparenchymal hematoma (SIPH) and 12 (21.43%) for stereotaxic biopsy.

**Results:** The male sex represented 58.93% and the female 41.07%. The average age of the patients was 38.84 years. The seat of the lesion was supratentorial in 91.07% and subtentorial in 8.93%. Regarding SIPH, the mean volume of aspirated blood was 49.78cc. Grade II astrocytoma was the most found histology. The number of patients with a Rankin score modified 4 decreased from 73.21% at one month postoperatively to 44.64% at 3 months, evolving towards scores 3 and 2. Complications related to surgery concerned 5.36% of patients (bleeding in the biopsy site and re-bleeding in the SIPH outlet cavity). We recorded 7.71% of deaths after 3 months of follow-up.

**Conclusions:** Stereotaxy has considerably improved our working conditions.

1652

## Skull Base

ePoster presentation

Changes in nasal airflow after endoscopic resection of pituitary adenomas using computational fluid dynamics modelling: Is olfaction affected?

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**Objectives:** This article seeks to determine the severity of changes in nasal airflow in patients after endoscopic pituitary adenoma resection with special regard to olfactory function using advanced numerical analysis called computational fluid dynamics.

**Background:** Even the most delicate endonasal surgery for pituitary adenoma causes changes in the nasal cavity, some of them permanent. Changes in olfactory function can be very debilitating.

**Methods:** The data from four patients were used in a numerical analysis using computational fluid dynamics. The open nasal cavities were modelled before and after surgery using CT scans. Some 2.2 million polyhedral cells formed the meshes after surgery compared to 1.8 million polyhedral cells in the meshes before surgery. We applied the k- $\epsilon$  turbulent model to compute the numerical investigation, which led to similar flow fields in the four patients.

**Results:** Our findings show that all four patients experienced an increase in the volume of the nasal cavity due to the endonasal transsphenoidal approach. The area of the nasal cavities in the coronal planes is increased by the passing endoscope and surgical tools. Because of the increase of these cross-sectional regions and no change in volume flow before and after surgery, airflow velocity decreases. The endoscope then enlarges the middle part of the nasal cavity, distributing most of the airflow here. This event impacts the decreased flow in the olfactory region and other peripheral areas of the nasal cavity, resulting in a decrease in olfactory function. Further studies are needed to confirm this hypothesis.

**Conclusions:** Surgery of the pituitary adenoma led to accidental changes to the anatomy in two of the four patients. Our results show that the anterior region of the nasal cavity is essential for airflow redistribution. During surgery, it is important to be aware of changes, no matter how little, as they may affect a shift in airflow.

1653

## Peripheral

ePoster presentation

Study of concordance and discordance between preoperative magnetic resonance imaging findings with intra-operative findings in peripheral nerve pathologies

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**Objectives:** To study the usefulness and efficacy of MRI in finding the location and pathology in peripheral nerves problems and correlating it with intra-operative findings.

To preoperatively prognosticate the peripheral nerve pathologies.

**Background:** It is important that the peripheral nerve pathologies are identified early, as majority of patients are young and delay in treatment can have lasting implications. Magnetic resonance imaging (MRI) is routinely used in formulating an appropriate management plan. This study aimed to assess the usefulness and efficacy of MRI in locating and diagnosing peripheral nerve pathologies, determining its role in prognostication and treatment planning.

**Methods:** It was a double-blinded prospective non-randomized study of diagnostic efficacy which was conducted on 42 surgically treated patients of peripheral nerve pathologies in the department of neurosurgery at P. D. Hinduja National Hospital and Medical Research Center, Mumbai, India. The radiologist conducted pre-operative MRI evaluation, while the neurosurgeon had no access to the scan. The operating neurosurgeon and team evaluated intra-operatively, keeping the radiologist blind. The data was then compared to determine concordance and discordance between two findings. Data was collected using MS-Excel, and Cohen's Kappa test was used for agreement. Diagnostic analysis was performed, with a P-value less than 0.05 considered significant. Statistical analyses were performed using SPSS software.

**Results:** We found that the overall sensitivity of MRI scan for diagnosing peripheral nerve problems was 97%, with specificity of 90%, positive predictive value of 97% and negative predictive value of 90%. The overall accuracy was found to be 95%, with Cohen's kappa value of 0.86, showing a strong level of agreement.

**Conclusions:** We conclude that MRI scan is an effective tool that helps in accurately diagnosing a plethora of peripheral nerves problems with significant intra-operative correlation, ultimately helping in patient care and management.



1657

## Functional

ePoster presentation

Motor and functionality recovery after intrathecal baclofen therapy in a patient with serious motor sequela after traumatic myelopathy

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**Objectives:** Shows a significant motor and functional recovery effects of intrathecal baclofen therapy.

**Background:** Spasticity after spinal cord injury, in addition to causing mobility difficulties, causes pain and limits quality of life and independence. Blocks, rhizotomies, ablations, botulinum toxin, selective dorsal rhizotomy are some of the existing treatments. The spinal cord stimulator is an option that can even help partially in motor recovery. Intrathecal baclofen therapy (ITB) can bring great benefits, with improvement in pain and spasms, quality of life and independence for activities.

**Methods:** Brazilian, female, 39 years old, past of surgery of anterior C5C6 discectomy and cervical arthrodesis, in 2020. On the first assessment, she brings a surgical description of intercurrence with intraoperative potential drop, with immediate quadriplegia. Magnetic resonance imaging (MRI) showed spinal cord contusion. She presented progressive improvement in strength and one year later she was walking with the aid of a walker with severe spasticity in all four limbs: grade 3 on the modified Ashworth scale and 4 on the Penn spasm scale. Neuropathic pain (NeP) in upper limbs (C5 cervical root territory) - and myofascial musculoskeletal pain (MMP) in four limbs, related to spasticity. Pain 9 /10 on the numerical verbal scale (NVS). Oswestry 2.0 Disability Index: 90% (disabled). After optimization of analgesia and physiotherapy improvement in NeP (4 /10) but no of MMP 9 out of 10, stiffness and maintenance of Ashworth and Penn scores.

**Results:** A trial with ITB at C5 level, resulted in significant improvement in symptoms with drop of 3 points on the Ashworth and 4 on the Penn scale, NVS: pain 2/10. Oswestry: 20% (minimum disability) indicating definitive IBT.

**Conclusions:** We described an excellent evolution after ITB, with improvement not only in pain, but also in motor recovery, gait and functionality. The patient had recovery her fine movements, agility and independent gait.

1658

## Spine

ePoster presentation

### Technical report of free hand pedicle screw placement using Kim's entry point for lumbosacral spine

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**Objectives:** This study reported Kim's entry point of lumbosacral pedicle screws with free hand technique and the accuracy of this technique.

**Background:** Different methods for lumbosacral pedicle screw insertion have been advocated; however, each technique has its cons and pros. Limited resources for C-arm and navigation in our locality enforced us to use our surgical skills to minimize the need for such advanced modalities.

**Methods:** We retrospectively reviewed the 118 cases with free hand placed lumbosacral pedicle screw placement. The diagnosis included 68 cases with degenerative spine, 45 cases with trauma, 5 cases with metastatic disease. A total of 708 lumbo-sacral pedicle screws were placed, and the entry points of lumbosacral pedicle screws were the junction of proximal edge of transverse process and lamina. Incidence and extent of cortical breach by misplaced pedicle screw was determined by review of intra-operative and post-operative radiographs and/or computed tomography.

**Results:** Among the total 708 lumbo- sacral free hand placed pedicle screws, 32 screws (4.5%) in 15 patients (12.7%) were repositioned screws with suspected screw malposition during operation, and 11 screws (1.5%) in 6 patients (5.08%) were identified as moderate to severe breaching the pedicle after post-operative imaging studies. Among the patient with malposition screws, 3 patients showed nerve irritation sign of the lesion, and 2 cases were symptom improved after nerve block and conservative management, and 1 case was removed the screw after the failure of the treatment.

**Conclusions:** Free hand pedicle screw placement based on external landmark with the junction of proximal edge of transverse process and lamina showed acceptable safety and accuracy and avoidance of radiation exposure.

1659

## Functional

ePoster presentation

**Syringomyelia: a rare complication after percutaneous spinal cord stimulation with excellent evolution after explantation**

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**Objectives:** Show the resolution of syringomyelia after an intradural SCS electrode removal.

**Background:** Percutaneous electrodes are less invasive, with lower incidence of pain due to less surgical manipulation, can be implanted under local anesthesia and sedation. The risk of puncture and intradural positioning exists, and complications such as infection, cerebrospinal fluid fistula, and hemorrhages are possible.

**Methods:** A 54-year-old patient, female, with previous history of spinal surgeries, starting in 2016: one L4/L5 discectomy, two lumbar arthrodesis; one discectomy and cervical arthrodesis three levels, one wireless spinal cord stimulator (SCS) implant in 2021. At the first evaluation in our group, she arrives with chronic pain in territory of T11/T12 and abdomen / pelvis, and in the left lower limb, L5 and S1 territories, distal left paresis L5 and S1 roots. The pain had an intensity of 9/10 on the numerical rating scale (NRS). Also loss of painful thermal sensitivity in abdomen, with preservation of tactile sensitivity. Oswestry 2.0 Disability Index: 60%. SCS without coverage of paresthesias in the area of pain. Due to the syringomyelic dissociation pattern of sensitivity she underwent to an spine MRI: syringomyelia with thin intermingled septations from T5-T6 to T9, close to the SCS electrode.

**Results:** It was decided to remove the electrodes by mini-hemilaminectomy and correct the possible dural lesion under neurophysiological monitoring. The procedure was carried out uneventfully and the position of the electrode in the subdural space was evident. The device was removed and the dural lesion was corrected.

**Conclusions:** To our knowledge, this is the first report of syringomyelia as a chronic complication of an intradural spinal cord stimulation electrode. Even more so with the typical pattern of syringomyelic sensitivity dissociation, which showed an excellent evolution, with complete improvement of pain, recovery of painful thermal sensitivity.

1662

## Oncology

ePoster presentation

Long-term corticosteroids for prevention of chemical meningitis in epidermoid: a treatment or a myth?

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**Objectives:** The effectiveness of a short duration over conventional long-term of corticosteroids in preventing postoperative chemical meningitis.

**Background:** Intracranial epidermoids are rare benign tumors. Chemical meningitis is a possible complication following resection. Traditionally, long-term corticosteroids are used prophylactically for prevention, but there is no clear consensus in the literature on the effectiveness and duration of this therapy.

**Methods:** We retrospectively reviewed 65 consecutive cases operated at our institute from June 2016 to December 2017. The cohort was divided naturally into two groups based on the duration of postoperative corticosteroids received by them. Both groups were assessed for surgical outcomes and the development of postoperative chemical meningitis or wound complications.

**Results:** Group A (n=28) and B (n=37) received steroids for an average of 4 days (range 3-7 days) and 30 days (range 21-42 days), respectively. The mean follow-up for the whole cohort was 9.2 months (SD ±12.14). The two groups were comparable statistically on all clinical parameters like age (p=0.878), gender (p=0.459), the extent of resection (p=0.246), contamination (p=0.557), intraoperative steroid use (p=0.185), post-op deficits (p=0.554), wound complications (p=0.345) and recurrence (p=0.182). However, the location of the tumor (p=0.041) and laterality (p=0.005) were different between both the groups along with the duration of hospital stay (p=0.036).

**Conclusions:** The short duration of steroids postoperatively for less than a week is effective in preventing chemical meningitis. At the same time, if GTR is not possible for any reason, short-term corticosteroids are enough to reduce the risk of postoperative chemical meningitis.

## Trauma

ePoster presentation

### Investigation of antiinflammatory effects of isoalantolactone on experimental traumatic spinal cord injury model in rats

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**Objectives:** Spinal cord injury stimulates an inflammatory reaction that causes substantial secondary damage inside the injured spinal tissue.

**Background:** The purpose of this study was to determine the anti-inflammatory effect of Isoalantolactone(IAL) on a traumatized spinal cord.

**Methods:** Spinal trauma model was created by dropping 15gr free weight from a 10cm height under a ketamine/xylazine anesthetized rat. A total of 32 male Wistar rats (n=8) were used in the study and the rats randomly divided as the following groups: 1. sham, 2. control trauma, 3. Trauma treated with Methylprednisolone (60mg/kg), and 4. Trauma treated with Isoalantolactone (IAL) (20mg/kg). At the end of the 24th hour, a neurological examination was performed to each group before scarification, after the sacrifice. Histopathological and immunohistochemical findings of spinal tissues were compared between the groups.

**Results:** (IAL) reduces inflammation by various ways in traumatic spinal cord injury, one of which is the NF- $\kappa$ B pathway. With the IAL treatment administered to the trauma group, neurologically significant improvement was achieved in the spinal cord injury ( $p < 0.0001$ ). Also, in the IAL treated group, the total number of NF- $\kappa$ B labeled cells has decreased in comparison to all other groups ( $p < 0.0001$ ). According to these findings, IAL has shown suppressive tendencies on the neuroinflammatory pathway NF- $\kappa$ B, in the spinal cord trauma model. IL-6 and TNF $\alpha$  secretions were significantly decreased in the IAL treated group ( $p = 0.002$ ). Evaluation of microglial and macrophage cells labeled by Iba-1 and F4/80 markers, has shown a significant reduction in these cells migration in the IAL treated group compared to the control trauma group ( $p = 0.0025$ ). It also reduced the number of neurodegenerative cells compared to the trauma and the trauma-treated group with Methylprednisolone.

**Conclusions:** Isoalantolactone contributed to the improvement of neurological functions in moderate spinal cord injury by inhibiting macrophages activation, T-cell infiltration, and NF- $\kappa$ B pathway of the neuroinflammatory process.

## Global Neurosurgery

ePoster presentation

### Scoping review of peer-reviewed literature to outline global neurology efforts

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**Objectives:** This review aimed to map the global neurology efforts using information from peer-reviewed articles.

**Background:** The neurological disease burden is disproportionately distributed globally with low- and middle-income countries accounting for the majority of disease burden. Global neurology, which combines neurology and global health practice, seeks to address this disparity through service delivery, research, policy, advocacy, and education.

**Methods:** This scoping review was conducted following the Arskey and O'Malley methodological framework. Peer-reviewed and grey literature on global neurology in English and French were searched in MEDLINE, Web of Science, and Google Scholar from database inception to December 15, 2021. The articles were deduplicated and each article title and abstract was screened independently by two authors. The articles' full-texts were equally screened independently and relevant data were extracted and later synthesized narratively.

**Results:** The search strategy returned 338 articles on all platforms. The authors identified and deleted 28 duplicates. After title and abstract screening, the authors excluded 231 articles and included 79 articles. Global neurology grew significantly during the 21<sup>st</sup> century, mostly driven by high-income country institutions including organized neurology organizations like the American Neurology Association and individual residency programs. Most efforts have focused on education/capacity-building, research, and service delivery.

**Conclusions:** The search strategy returned 338 articles on all platforms. The authors identified and deleted 28 duplicates. After title and abstract screening, the authors excluded 231 articles and included 79 articles. Global neurology grew significantly during the 21<sup>st</sup> century, mostly driven by high-income country institutions including organized neurology organizations like the American Neurology Association and individual residency programs. Most efforts have focused on education/capacity-building, research, and service delivery.

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## Oncology

ePoster presentation

Clinical and surgical outcome in diffuse midline glioma in paediatric and adult population

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**Objectives:** To determine the clinical and surgical outcome of patients who have undergone surgery for DMG. To study disease severity in patients with DMG

**Background:** Diffuse midline glioma (DMG), H3K27M mutant is a rare and aggressive midline high grade glioma with a predominant astrocytic differentiation and K27M mutation in either H3F3A or HIST1H3B/C. This tumor is more common in children than in adults. Hence, the current study was aimed to determine clinical and surgical outcome of patients who have undergone surgery for DMG and study disease severity of patients with DMG.

**Methods:** This is an observational study in which 29 DMG patients were evaluated for clinical and surgical outcomes by assessing the pre and postoperative neurological status.

**Results:** Survival duration was significantly high in patients with age > 18 years ( $p=0.02$ ). Patients who had undergone radiation therapy showed higher survival rate ( $p=0.05$ ).

**Conclusions:** DMG with H3 K27M newly classified Central Nervous System tumor with grade IV, comprising morphologic and molecular features for diagnosis and related with a poor prognosis.

## Oncology

ePoster presentation

### Occipital sinus-sparing linear paramedian dural incision: a technical note and case series for median suboccipital approach

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**Objectives:** Durotomies, traditionally used during the midline suboccipital approach, involve sacrificing the occipital sinus (OS) with consequent shrinking of the dura, risk of venous complications, difficulty performing watertight closure, and a higher rate of postoperative (cerebrospinal fluid) CSF leaks.

**Background:** The present technical note describes the OS-sparing linear paramedian dural incision, which leads to a decrease in the risk of complications during the median suboccipital approach in our case series.

**Methods:** The OS-sparing linear incision technique involves a dural incision placed 1 cm lateral to the OS. No coagulation is used. The angle of view of the microscope is frequently changed to overcome the slightly narrowed exposure of the linear durotomy. Copious irrigation with saline prevents drying of the dura. A running watertight closure of the dura is used with resorbable vicryl 4/0 stitches. The overall results of five cases are herein reviewed.

**Results:** The cases were three tumors and two cavernomas. The OS was preserved in all five, and no duraplasty was needed. The average dura closure time was 16.8 minutes. No CSF leak occurred, and no wound complications were observed. A gross total resection of the lesion was achieved in all the patients. The mean follow-up was 4.6 months, and there were no late complications related to the dura closure.

**Conclusions:** In comparison to the types of durotomies conventionally used for the midline suboccipital approach, the OS-sparing linear paramedian dural incision entails lower risks of bleeding, venous complications, CSF leaks, and infections by avoiding duraplasty. Validation of this technical note on a larger patient cohort is needed.



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## Functional

ePoster presentation

Towards accurate hemifacial spasm severity classification: leveraging augmented reality and facial tracking technology

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**Objectives:** We introduce an innovative approach that leverages facial recognition and tracking technology to objectively quantify and classify the severity of hemifacial spasms.

**Background:** Currently available grading and classification systems for Hemifacial spasm (HFS) severity either rely on subjective assessments or are excessively intricate, resulting in areas of overlap and impracticability.

**Methods:** Retrospective review of our prospectively maintained preoperative videos database for microvascular decompression (MVD) was done. High quality videos showing the complete face of the patient with at least spasms lasting 15 seconds were extracted using "blendartrack" software and further analyzed using "Blender" software. Four factors were considered for the grading system (2 for amplitude and 2 for frequency of the spasms). Clustering of the patients was done using both divisive k-means and agglomerative hierarchical clustering. Correlation-Analysis with preoperative quality of Life (Qol) using SF-36 questionnaire scores was done.

**Results:** 79 preoperative videos met our inclusion criteria. Both up-bottom and bottom-up clustering approaches clustered the patients into 3 different groups/clusters according to the 4 variables (eye closure, mouth distance change, rate, and repetition of the spasms) with 100% identical results. Correlation of the groups with the Qol was done only for 45/79 patients (57%). In contrast to group 3(mouth tonic/clonic group), group 1 (eye tonic contraction group) showed the worst mental and emotional Qol scores. Group 2 (clonic group) had the best total average Qol score in comparison to the other two groups. These results did not show statistical significance with ANOVA.

**Conclusions:** This novel classification method aims to guide treatment decisions and monitor outcomes effectively, offering a promising solution to the existing non-accuracies and complexities in grading and classification systems and can help us objectively compare the preoperative to the postoperative outcome.

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## Neurovascular Surgery

ePoster presentation

Immersive photorealistic three-dimensional neurosurgical anatomy of the cerebral arteries. A photogrammetry based anatomical study

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**Objectives:** The objective of this study is to create high-quality three-dimensional (3D) anatomical photorealistic models based on dissections of the brain arterial anatomy by using a modern surface scanning photogrammetry algorithm.

**Background:** Neurosurgeons need a profound knowledge of the surgical anatomy of the cerebral arteries to safely treat patients. This is a challenge due to numerous branches, segments and tortuosity of the main blood vessels that supply the brain.

**Methods:** Two formaldehyde fixed heads were used for this study. Vessels were injected with radiopaque material which was supplemented with colored silicone and latex. Prior to the dissections the specimens were scanned by computer tomography (CT) to generate high-detail computed tomography angiograms (CTA) of the extra- and intracranial arterial vessels. Stratigraphical anatomical dissection of the neck and brain was performed to present the relevant vascular anatomy. A simplified surface scan using a mobile phone-based photogrammetry application together with open-source 3D software were the primary methods to generate the 3D models.

**Results:** Fifteen detailed layered photorealistic and two CT angiography-based 3D models were generated. The models allow zooming, panning or rotating the data sets with sufficient photographic detail of the scanned data. Topographical relevant anatomical structures and landmarks were annotated and uploaded for web-viewing on a dedicated 3D online platform. The implementation of the data to augmented and virtual reality environments provided more options for immersive teaching opportunities with positive feedback from neurosurgical and neurological residents as well as medical students.

**Conclusions:** Cerebral vascular anatomy presented with photogrammetry surface scanning method allows sufficient detail to present individual vessels course and even small perforating arteries in photorealistic 3D models. These features, including AR/VR visualization, provides new teaching prospects allowing creation of 3D databases especially useful in cases with limited cadaver training availability.

1680

## Trauma

ePoster presentation

### Frequency and clinico-radiological characteristics of traumatic thoracolumbar fractures: an institute-based experience

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**Objectives:** To determine the frequency, demographics and clinic radiological characteristics of patients with traumatic thoracolumbar fractures presenting to a level I trauma center in Karachi.

**Background:** Thoracolumbar fractures are the most common type of injuries seen in the emergency department in patients with spinal trauma. The incidence and characteristics of spinal fractures vary among different populations and regions.

**Methods:** A total of 318 patients diagnosed with TLF at Shaheed Mohtarma Benazir Bhutto Institute of Trauma, Karachi from 1st January 2022 till 31st December 2022 were included in this study. Their medical records were collected, and epidemiological data including age, sex, injury level, etiology, type of fracture, thoracolumbar AO spine injury score (TLAOSIS), McAfee class and American Spinal Injury Association (ASIA) impairment scale (AIS grade), were extracted.

**Results:** A total of 318 patients with TLF between January 2022 and December 2022 were included in the study with an incidence of 0.13 per 100,000. Majority of patients were males (66%). Injury mechanism was RTA in most of the cases (60.4%) followed by fall (35.8%), assault (1.9%) and other mechanisms (1.9%). Burst was the most common fracture type (56.6%), followed by compression (18.9%), flexion/distraction (13.2%), chance (9.4%), and burst-flexion/distraction (1.9%). The most common fracture level was L1, diagnosed in 96 patient (30.2) followed by D12 level (20.8) which was diagnosed in 66 patients out of 318.

**Conclusions:** There is sparse data available on traumatic thoracolumbar fractures from our population. The results will help in developing a basis for future studies, add to the epidemiological data on the subject and help in developing strategies to minimize the frequency of traumatic thoracolumbar fractures and in the long run decrease the socioeconomic burden.

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## Skull Base

ePoster presentation

Endoscopic trans-eustachian tube approach: identifying the precise landmarks, a novel radiological and anatomical evaluation

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**Objectives:** The endoscopic trans-eustachian approach (ETETA) is a less invasive approach to the infratemporal fossa (ITF) and provides better exposure than the traditional transcranial approaches.

**Background:** The anatomy of the eustachian tube (ET) and adjacent neurovascular structures is complex and requires in-depth knowledge to safely perform this approach. We present a cadaveric and radiological assessment of critical anatomic considerations for ETETA.

**Methods:** Six adult cadaveric heads were dissected in conjunction with multiple anatomic features in 50 paranasal sinus CT scans. The key anatomic relationships of ET and adjacent structures were qualitatively and quantitatively evaluated. Descriptive statistics were performed for quantitative data.

**Results:** Anatomical and radiological measurements showed the lateralization of the ET allows to reach the ITF. The ET has bony and cartilaginous parts and the junction of them were the sphenoid spine and foramen spinosum. The bony part and the tendon of the tensor tympani muscle (TTM) were located in the posterior genu of the internal carotid artery (ICA) and the anterior and inferior wall of the carotid.

**Conclusions:** The combination of preoperative radiographic assessment and anatomical correlation demonstrates a safe and effective approach to ETETA, which allowed satisfactory visualization of ITF. The morphological evaluation showed that the lateralization of the ET and related structures allowed a surgical corridor to reach the ITF. Endoscopic surgery through the ET is challenging, and in-depth understanding of the key anatomic relationships is critical for performing this approach.

## Trauma

ePoster presentation

Prediction of evolution of cerebral contusions and edema following traumatic brain injury: any role of biomarkers?

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**Objectives:** We hypothesize that BBBB and inflammation contribute to pathogenesis of cerebral edema and want to study these phenomena with help serum biomarkers and predict evolution of cerebral edema.

**Background:** Secondary injury is preventable phenomenon in head injury likely due to Blood brain barrier disruption (BBBD), neuroinflammation and excitotoxicity, which can manifest as cerebral edema. Cerebral edema is most common cause of delayed neurological deterioration.

**Methods:** This was a prospective observational study in 53 patients with isolated head injury patients. Volume of contusion, edema was measured on NCCT head and blood samples were taken at day 0 and 3 to estimate the serum GFAP, UCHL-1, HMGB-1 and IL-6 levels with ELISA. Chi-square test is used to association between the serum biomarkers, cerebral edema, and surgery. ROC curve used to determine cut off for biomarker to predict cerebral edema and surgery. A p-value < 0.05 will be considered as statistically significant.

**Results:** Mean age of patients was 36.4 yrs. 14 patients had severe injury, 15 patients had moderate head injury, and 24 patients had mild head injury. Patients with more than 40.45ml of volume of contusion + edema at 72hrs had a sensitivity of 89% and specificity of 73% to undergo surgery. Mass lesions with larger proportion of contusion were likely to expand, produce edema and undergo surgery. There was statistically significant fall of HMGB levels in patients who underwent surgery.

41 patients had increased in the size of contusion and edema, with a mean increase of 13ml. HMGB and UCHL-1 showed a statistically significant increase in levels in patients with no increase in the size of contusion and edema.

**Conclusions:** Majority of the patients 77.4% patients showed increase in the size of contusion and edema with 17 % patients requiring surgery. Higher levels HMGB, and UCHL-1 had a protective effect over secondary brain injury.

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## Skull Base

ePoster presentation

Prognosis of MPNST about cochleovestibular nerve. About two cases operated on in the Neurosurgery Department of the Hôpital Nord Marseille

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**Objectives:** To assess the postoperative prognosis of patients with malignant peripheral nerve sheath tumors (MPNST) of the cochleovestibular nerve.

**Background:** Of 270 patients operated on for schwannomas, two were malignant, justifying the study.

**Methods:** Retrospective study of two cases operated on in twenty years at the CHU Nord Marseille (FRANCE) with histological proof of MPNST. Subtotal excision via the retrosigmoid approach was performed as first-line treatment in the hypothesis of a Koos IV vestibular schwannoma. After histological results, surgical revision of maximalist excision by enlarged translabyrinthine approach was indicated.

**Results:** The first patient was 58 years old with no history (ATCD) of neurofibromatosis. On a balance sheet of hearing disorders, we discover a vestibular schwannoma (VS) of stage II of Koos. She was treated with Gamma Knife radiosurgery (GKRS). Clinico-radiological monitoring of the lesion shows a compressive evolution, requiring surgical excision, the histology of which reveals MPNST. She received adjuvant treatment but presented with recurrent lesions. This time, she benefited from wide resection via a translabyrinthine approach. Four months later, the tumor recurred with a leptomeningeal metastasis preceding his death.

The second patient is a 66-year-old man without ATCD of NF, who was treated 7 years earlier for VS by GKRS. New clinical symptoms motivate brain imaging. Radiological augmentation and neurological compression indicate subtotal excision surgery via the retrosigmoid approach. Histology was in favor of MPNST. The lesion recurred in two months. It is operated by translabyrinthine way. The excision is total. The lesion recurs early, before adjuvant treatment can be given. The patient is operated on but dies from the operation.

**Conclusions:** MPNSTs are rare. They concern patients of all ages with no gender predominance. They have no specific characteristics. The radio-induced nature is difficult to confirm without histological proof before irradiation. Despite wide excision, recurrence is the rule.

1690

## Oncology

ePoster presentation

### Gamma-knife stereotactic radiosurgery for giant meningiomas - series of 28 patients

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**Objectives:** To assess the radiological and clinical outcomes of large intracranial meningiomas (volume  $\geq 20$  cc) managed with Gamma Knife Stereotactic Radiosurgery (GKSRS).

**Background:** Surgery remains the primary option in large intracranial meningiomas, there are significant number of patients who either refuse or are not amenable for surgery. We explored the role of stereotactic radiosurgery in such tumors as an alternative to External Beam Radiation Therapy (EBRT).

**Methods:** This retrospective study was carried out in a single center over 8 years (from January 2012 - December 2019). Patients with intracranial meningiomas with volume  $\geq 20$  cm<sup>3</sup> receiving GKRS with a minimum of 24 months of follow up were included in the study. Demographic profile, clinical presentation, functional status, radiological details and follow-up clinico-radiological findings were acquired and analyzed.

**Results:** Twenty-eight patients (15 male) had pre GKRS tumor volume  $\geq 20$  cm<sup>3</sup>. Mean age was  $50.5 \pm 10.5$  (range 28–75). Majority (26/28, 92.8%) of the patients received GKSRS in a single stage. Mean target volume at the time of radiosurgery was  $34.75 \pm 10.45$  cm<sup>3</sup> and mean radiation dose to the target margin was  $12.8 \pm 0.6$  Gy. At a mean follow up of  $49.8 \pm 24.8$  months, tumor control was achieved in 92.8% (n=26) of the patients, with tumor progression occurring in 2 (7.2 %) patients. Adverse radiation effects were noted in 4 (14.4%) patients including post radiation imaging (PRI) changes in 2 (7.2%) patients.

**Conclusions:** The present series defines 'Giant intracranial meningiomas' for GKRS and is the largest study with single fraction GK to meningiomas with volume  $> 20$  cm<sup>3</sup> in literature, which demonstrates excellent radiological and clinical outcomes in these patients. GKRS may therefore be considered as a viable option in such giant intracranial. However, longer follow up is required to assess long term tumor control rates and adverse radiation effects. Giant intracranial meningiomas, Gamma-knife, Stereotactic radiosurgery, Outcomes.

1691

## Paediatric

Oral presentation

Initial experience with focused ultrasound in pediatric patients with DIPG at Children's National Hospital: rationale and technical considerations

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**Objectives:** To review workflow optimization and rationale behind a year of experience executing two ongoing clinical trials to treat pediatric DIPG with MR-guided focused ultrasound (MRgFUS).

**Background:** Diffuse intrinsic pontine glioma (DIPG) is an inoperable pediatric pathology with 9-12 month average survival. Current standard of care is radiotherapy alone. Preclinical studies demonstrate tumor cell death using two separate mechanisms: sonodynamic therapy (SDT) or blood-brain barrier disruption (BBBD), followed by chemotherapy, and serve as the basis for designing two separate clinical trials. Technical considerations and workflow optimization can be learned from these clinical trials at our institution.

**Methods:** DIPG patients who completed radiotherapy were enrolled as part of two ongoing clinical trials. SDT-201 utilizes SDT and activation of ALA using MRgFUS, generating reactive oxygen species and inducing apoptosis. BT-016 utilizes MRgFUS after intravenous administration of microbubbles for BBBD to facilitate doxorubicin delivery. Procedural duration, demographics, radiographic and clinical outcomes were followed prospectively. The primary objective was to evaluate treatment safety and tolerance.

**Results:** Seven patients (range: 5-14 years, 3 male: 4 female) received a total of 15 treatments; 6 under SDT-201, and 1 in BT-016. Mean total procedural time was 350 and 340 minutes, respectively. Sonication time took 147 and 112 minutes, respectively. Body temperature was optimized with MRI compatible Baur-huggers, heating packs, and insulating drapes. An anterior cross-bar was designed for pediatric head-frame positioning. Patients all discharged on post-procedure day 1 without radiographic or clinical complication.

**Conclusions:** The first-in-human experience utilizing novel therapeutic strategies with MRgFUS for DIPG demonstrate safety over one year. In both clinical trials, workflow efficiency decreased treatment duration and reduced procedural impediments. Future studies will review safety data in a dose-dependent fashion as the primary outcome, and both clinical and radiographic measures as secondary outcomes. MRgFUS stands as an innovative treatment strategy for pediatric brain tumors.



1692

## Oncology

ePoster presentation

### Graftless primary dural closure following retrosigmoid approach: doing more with less

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**Objectives:** Watertight dural closure is rarely possible with the retrosigmoid approach, which explains the nonnegligible rate of postoperative cerebrospinal fluid (CSF) leak. The ability to close the dural closure in a short time without any graft may reduce the rate of CSF leakage and shorten the duration of surgery.

**Background:** The herein-reported study describes the proposed graftless primary dural closure technique following the retrosigmoid approach and summarizes the clinical data of the preliminary authors' experience.

**Methods:** Clinical and surgical data of 227 patients who underwent graftless primary dural closure technique following the retrosigmoid approach for various pathologies were retrospectively reviewed. Graftless reconstruction involves two critical and propaedeutic steps: a 1 cm transverse dura incision parallel to the foramen magnum to drain the CSF in the cisterna magna and a vertical linear opening of the retrosigmoid dura. The dural incisions are closed watertight with vicryl 4/0 running suture, without graft, fibrin glue, overlay hemostatic, or dural substitutes. Pre- or postoperative lumbar drainage is unnecessary.

**Results:** A primary watertight dural closure was successfully achieved in all the patients without grafts or duraplasty. The average dura closure time was 17.8 minutes. The median hospital stay was five days. On an average follow-up of 5.8 months, no CSF leaks or meningitis occurred.

**Conclusions:** In the authors' initial experience, the graftless primary dural closure technique has been linked to a zero rate of CSF leaks and bacterial meningitis following the retrosigmoid approach. A retrosigmoid linear dural incision is the key to the following graftless watertight reconstruction. Validation of the suggested technical note on a larger patient cohort is needed.

1693

## Paediatric

ePoster presentation

Langerhansian histiocytosis of cranial location about one case

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**Objectives:** Treatment Langerhansian Histiocytosis of Cranial Location.

**Background:** Langerhans histiocytosis (HL), formerly known as histiocytosis X, can be defined as a non-malignant proliferative disease, which involves the Langerhans dendritic cells that are normally found in the epidermis and in the mucous membranes located at the interface with the external environment.

**Methods:** 4-year-old female child with a history of myelomeningocele operated at the age of 06 months where she underwent resection of the pouch with a ventriculoperitoneal shunt, who consults for a right temporal rounded tumefaction next to the catheter of the valve evolving for a few months..*Clinical examination* : Presence of a rounded blackish crust 7 cm in diameter, right retro auricular next to the ventricular catheter of the valve with sero-haematic flow.

**Results:** Histopathological appearance and immunohistochemical profile of Langerhens cell histiocytosis.

**Conclusions:** Eosinophilic granuloma is the most common form of HL (50%). It mainly affects the bone in 82% of cases. It can be single (90%) or multiple (10%), with simultaneous or successive damage.

1697

## Spine

ePoster presentation

### Minimally invasive management of cervical spondylodiscitis. A multicenter experience

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**Objectives:** The aim of the present study was to evaluate a multicenter experience implementing a minimally invasive surgical approach (MINSa) to manage such pathology vs most complex and aggressive surgical strategies currently used.

**Background:** The main management objective of cervical spondylodiscitis (CSD) is represented by the urgent etiological diagnosis to start as soon as possible antibiotic treatment to prevent neurological deterioration.

**Methods:** Retrospective multicenter study on a prospectively built database of a 70 patients' series during a 10 years period in 5 European tertiary neurosurgical centers. Seventy consecutive patients harboring primary CSD undergoing MINSa were included. Formal diagnosis was made in all patients on clinical presentation, imaging findings, laboratory investigation and finally confirmed by histopathological and bacteriological analysis of perioperative specimens.

**Results:** Among the 70 patients studied 41 were men and 29 women with a mean age of 47.67 years. Severe neck pain was the most common symptom present in 45/70 (64.28%) patients. Fifty-one (72.85%) patients presented a single cervical level of spondylodiscitis, 14/70 (20%) a double level and 5/70 (7.14%) a triple level respectively. The most common identified microorganism was *Staphylococcus aureus* in 49/70 (70%) patients. Each patient received 3 months' antibiotics treatment. With a mean follow-up period of 48 months all patients showed a complete recovery without neurological deficits. Infectious process was healed in all patients and demonstrated by the normalization of all serological parameters. Neither spine instability nor kyphotic deformation was recorded and bone fusion confirmed radiologically in all patients. No infection recurrence occurred.

**Conclusions:** Minimally invasive surgical treatment of cervical spondylodiscitis is a valuable management option to identify the microorganism involved and/or to decompress the spinal cord assuring as much as possible mechanical stability resulting in excellent patient's outcome.

## Skull Base

ePoster presentation

Exploring surgical solutions for Chiari I malformation: unraveling key indicators for improved outcomes

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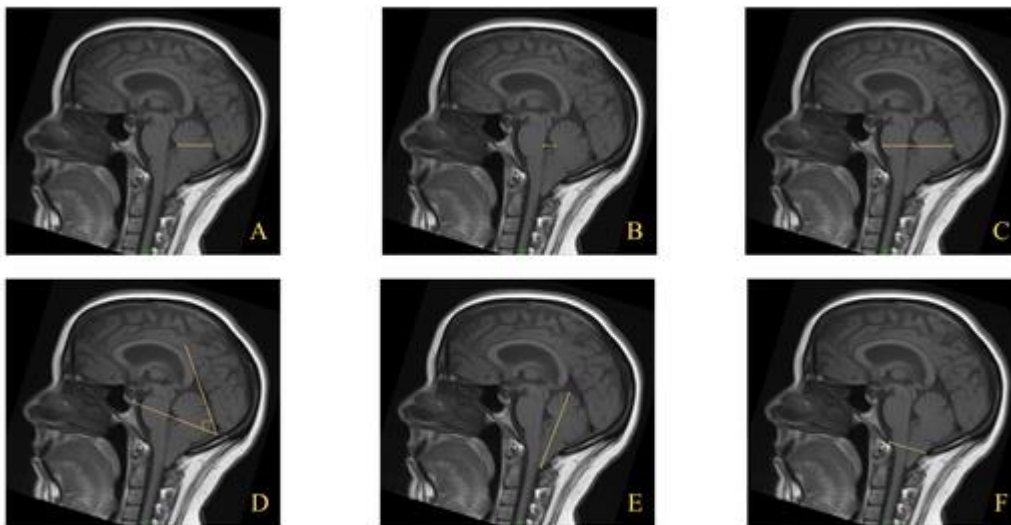
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**Objectives:** Posterior cerebral fossa area measurements could aid in surgical decision-making. It aimed to identify indicators for surgery and assess changes in measurements after surgical correction.

**Background:** The study explores headache symptoms in Chiari Malformation type I (CMI) patients, finding suboccipital headaches as the most common sign, potentially related to obstructed CSF flow, and highlights the importance of cough-related headaches as predictors of positive surgical outcomes.

**Methods:** The study will be a retrospective review of patients with previously diagnosed and treated Chiari I malformation at the OSUMC from July 2010 to Dec 2022. It will involve analyzing MRI imaging and clinical data collected during routine workups. The posterior cranial fossa will be evaluated using midline sagittal T1-weighted MRI scans, measuring various parameters. Two measurements will be taken before and after surgery to assess changes.



**Figure 1** A T<sub>1</sub>-Weighted sagittal MR image showing the midline structure of posterior cranial fossa and the brainstem and the cerebellum. A = Width of Cerebellar, B = Width of 4th Ventricle, C = Width from Cerebellar to Pons, D = Tentorial Angle, E = Height of Cerebellar, F = Width of McRae line

**Results:** The retrospective analysis included 95 eligible patients out of 116 who underwent treatment. The average age of participants was 35 years, with a majority of females. Preoperative headache pain scores significantly improved post-surgery. Correlation analysis indicated significant improvements in various symptoms after surgery. Significant differences were observed in the width of the 4th ventricle, cerebellar-to-pons width, and height of the cerebellar.

However, the McRae line measurement was not possible due to craniectomy. Changes in most measurements were not significantly associated with changes in pain score, except for the 4th ventricle width, which negatively correlated with postoperative pain score. Comparing preoperative values with the normal population, the cerebellar width, 4th ventricle width, Tentorial angle, and McRae line width exhibited significant differences.

**Conclusions:** The width of the 4th ventricle is a useful indicator for surgery in symptomatic Chiari patients, and significant measurement differences provide valuable insights for informed surgical decisions, especially in cases with unclear symptoms like isolated headaches.

1704

## Neurovascular Surgery

ePoster presentation

Case series of 52 internal carotid aneurysms in 2.5 years

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**Objectives:** Compare endovascular and microsurgical treatment of internal carotid artery aneurysms.

**Background:** Treatment of Paraclinoid aneurysms remains a technical challenge because they occupy a tiny region packed with critical structures, including the C5 and C6 segments of ICA, their branches, and the optic apparatus, cavernous sinus.

**Methods:** In the last 2.5 years, we treat 52 patients with ICA aneurysms.

18 (34%) patients underwent endovascular treatment and in 34 patients (66%), microsurgical clipping was done.

**Results:** CTA images with 3D reformatting can very helpful in evaluating the association of aneurysm with ACP and the need for clinoidectomy during a microsurgical approach.

In cases of microsurgical clipping, if clinoidectomy is essential for proximal control or aneurysm exposure, therefor cervical carotid must be prepared for proximal control.

In our endovascular group, according to the aneurysm neck and aspect ratio, we treat a patient with primary coiling, stent assists coiling, and flow diverting stent.

In Our case series, P.com is the most location for aneurysm formation and rupture.

While more than 90% of P.com aneurysms are microsurgically treated, 70% of ophthalmic aneurysms are treated with an endovascular approach.

In long-term follow-up, 90% of our patients have GOS 4 and 5, 2% have GOS 3 and 8% have GOS 1 or 2; that is not different in the endovascular or microsurgical group.

**Conclusions:** Treatment of ICA aneurysms requires precise anatomical evaluation and a multi-disciplinary approach. Both endovascular and microsurgical approaches are effective and have the same result.

1708

## Oncology

ePoster presentation

Establishment of a risk prediction model for olfactory disorders in patients with transnasal sellar pituitary tumors by machine learning

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**Objectives:** To apply machine learning algorithms to construct a prediction model for olfactory impairment in patients after transsphenoidal pituitary tumour resection, and to screen the optimal prediction model, with a view to providing technical tools and references for the treatment and rehabilitation of patients after pituitary tumour resection.

**Background:** At present, there are few reports that the prediction model of olfactory disorder risk after pituitary tumor surgery has good prediction performance and great clinical application potential.

**Methods:** To investigate postoperative patients with transnasal sellar pituitary tumor admitted to the neurosurgery department of three Grade III general hospitals in Sichuan Province from January 2022 to December 2022. Different machine learning models such as BP, LR, DT, SVM, RF, LightGBM, XGBoost and AdaBoost were established to predict the risk of olfactory disorders. accuracy, precision, recall, f1\_score and ROC were used to evaluate the prediction performance of the model.

**Results:** The results showed that the highest values of the five evaluation indicators all appeared in the model with Lasso method and RF machine learning model. The highest values of accuracy, accuracy, recall, F1 value and AUC were 0.750, 0.870, 0.947, 0.833 and 0.846, respectively.

**Conclusions:** In this study, machine learning algorithms were used to establish and evaluate a risk prediction model for olfactory disorders in patients undergoing transsellar pituitary tumor resection. Duration of operation, gender, type of pituitary tumor, pituitary tumor apoplexy, nasal adhesion, age, cerebrospinal fluid leakage, hematocrysis and smoking history are key indicators of olfactory smell. This model has good prediction effect and has potential clinical application prospect.

1709

## Neurovascular Surgery

ePoster presentation

### Giant petrous segment aneurysm causing facial palsy: case report

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**Objectives:** Co-occurrence of aneurysm causing facial palsy by compression and fibrous dysplasia.

**Background:** The aim of this study is to acknowledge this condition due to its rare frequency.

**Methods:** We report a case of a 54 year old patient presenting with sporadic right hemifacial spasms, lasting up to a minute. In 2023 it evolved with facial palsy House Brackmann V and episodes of headache. Imaging investigation showed a giant petrous segment aneurysm on the right internal carotid artery, with signs of aneurysm thrombosis, compression of the internal acoustic meatus and fibrous dysplasia of the temporal bone as well as erosion in the petrous apex. In our case embolization with coils was proposed.

**Results:** Petrous segment aneurysms are rare, and so is fibrous dysplasia. The clinical presentation depends on aneurysm's location, size, and direction of growth, with the majority being asymptomatic. Aneurysms in close proximity to the middle ear may cause hypoacusis and tinnitus as well as otorrhagia and epistaxis, Horner's syndrome and symptoms of the jugular foramen nerves in the case of rupture. The involvement of the VII nerve is not common. About the fibrous dysplasia, it is characterized by fibrous tissue replacement of normal bone. The temporal bone is affected in 18% of cases and it is equally distributed in relation of the sex of the patients.

Current treatment options for those aneurysms include carotid artery balloon occlusion, embolization with coils, remodelling with stents or conservative management by serial imaging exams.

**Conclusions:** Although compression of the VIIth-VIIIth nerve complex is uncommon for posterior fossa aneurysms it represents an important potential complication of vascular pathological features by disabling patients



1716

## Trauma

ePoster presentation

Serum perioperative inflammatory cytokines and their relationships with seizures outcomes among patients with traumatic brain injury

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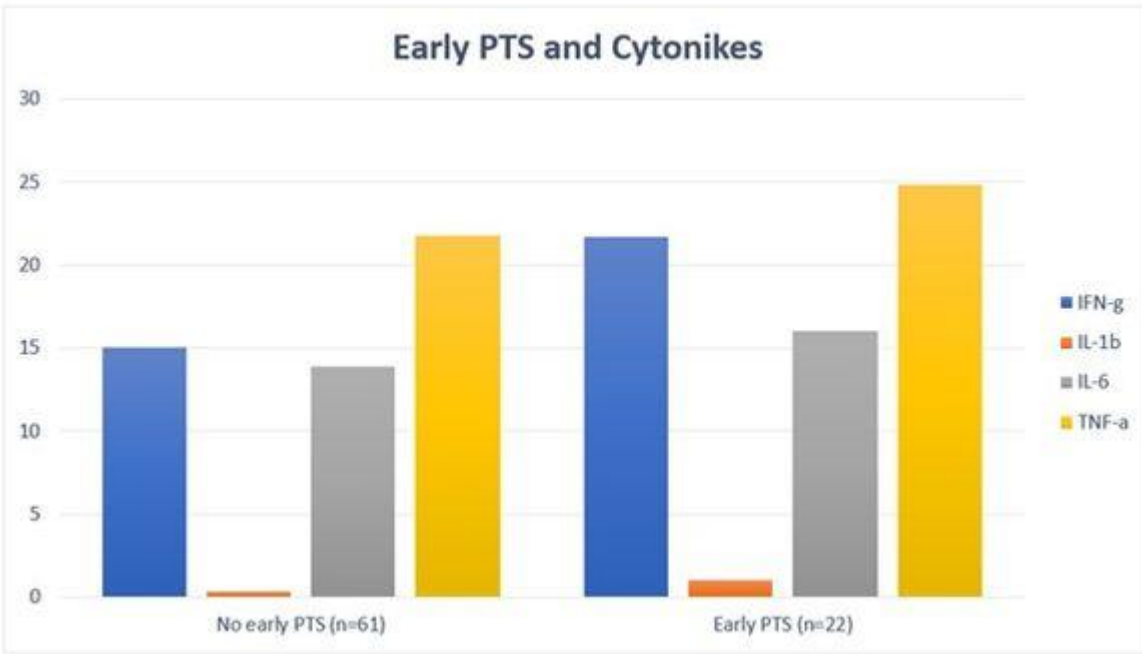
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**Objectives:** To elucidate the relationship between serum perioperative inflammatory cytokines' expression and occurrence of post-traumatic epilepsy (PTE).

**Background:** Morbidity and subsequent mortality related to traumatic brain injury (TBI) are due to secondary brain insult through deleterious systemic inflammatory responses. Inflammatory cytokines are contributors to neuroinflammation, that is believed to lead to seizure development. After the primary brain insult, a systemic stress response is triggered, releasing the systemic inflammatory cytokines, causing important biological and sub-clinical changes from the neuroinflammation with occurrence of early and potential late PTE. We hypothesized that the severity of injury and the timing of major TBI surgery (under general anaesthesia) in the acute phase can modify the expression of inflammatory cytokines that contributes to the occurrence of PTE.

**Methods:** This was a prospective cohort study among mild-moderate TBI patients exclusively with depressed skull fractures, hemodynamically stable, undergoing TBI-surgery at different timing. They had phlebotomies pre/postoperatively to measure changes of serum inflammatory cytokines. Plasma from collected venous blood samples were processed and stored consecutively in -80°Celsius, thereafter retrieved for Luminex Assay of serum levels of pro/anti-inflammatory cytokines using the kits of 96-well human cytokine "27-Plex-Assay (BBRDM500KCAF0Y®)". Patients were followed up in-hospital, then in outpatient clinics every 3 months by phone call appointment up to a minimum of 15 months to record the occurrence early and late PTE.

**Results:** Patients were 82 (85%males; x=22-years) recruited during the period from 01/03/2021 to 28/02/2022. The majority had motorcycles' road traffic crushes and assault. Twenty-one patients had early-PTE, and 11 late-PTE. Elevated preoperative IL-1b, IL-6, IFg, and TNF were associated with the occurrence of early PTS while perioperative IL-7, IL-8, and IL-10 were associated with late.



**Conclusions:** Early and late PTE are possibly related to particular peri-operative inflammatory cytokines' expressions due to the neuroinflammation amplitude.

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## Endovascular Neurosurgery

ePoster presentation

Clinical outcomes of radiation-induced carotid stenosis

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**Objectives:** This study is aimed to evaluate the short-term and long-term outcomes after surgery for radiation-induced carotid stenosis.

**Background:** Clinical outcomes of radiation-induced carotid stenosis are still unclear.

**Methods:** PubMed, EMBASE, the Cochrane Library and Web of Science were searched for relevant RCTs and observational studies which reported short- and long- term outcomes after carotid endarterectomy (CEA) and carotid angioplasty and stenting (CAS) for carotid stenosis induced by radiation. Risk of bias were assessed through different scales according to study design. I<sup>2</sup> statistic were used to evaluate the heterogeneity, and meta-regression and subgroup analysis were performed to investigate the source of heterogeneity.

**Results:** A total of 26 studies with 1002 patients were included. CEA was performed in 364 patients and CAS in 638 patients. The estimated rate of short-term stroke was 0.19% (95% CI=0-0.90%), and the rate of long-term stroke was 2.68 % (95% CI=1.19-4.57%). The rate of CNI in CEA group was significantly higher than that in CAS group [risk ratio (RR)=6.03, 95% CI=1.63-22.22, *P*=0.007], however, there was a tendency of decreasing year after year. The univariate meta-regression analysis showed that the risk of stroke in CAS group were significantly higher than CEA group in both short-and long term [incidence rate ratio (IRR) =3.62, 95% CI=1.21-10.85, *P*=0.22; IRR=2.95, 95% CI=1.02-8.59, *P*=0.046), respectively].

**Conclusions:** This study provided the worldwide profile of outcome of treatment for radiation-induced carotid stenosis, and also found that CEA can yield better results for these patients than CAS.

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## Endovascular Neurosurgery

ePoster presentation

### In-stent restenosis after vertebral artery origin stenosis stenting

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**Objectives:** To propose a nomogram for individual risk assessment of in-stent restenosis (ISR) after vertebral artery origin stenosis (VAOS) stenting.

**Background:** To propose a nomogram for individual risk assessment of in-stent restenosis (ISR) after vertebral artery origin stenosis (VAOS) stenting.

**Methods:** We included 793 patients with VAOS treated with stenting from October 2006 to May 2013, with a median follow-up of 27.8 months. Cox regression and the least absolute shrinkage and selection operator (LASSO) regression were adopted for variable selection. The nomogram was formulated and validated by concordance indexes (C-indexes) and calibration curves. An in-stent restenosis risk table (ISR-RT) was subsequently generated for risk stratification. Differences between low-, intermediate-, and high-risk levels were shown by Kaplan-Meier curves and compared by log-rank test.

**Results:** The training and validation set included 594 and 199 patients, with a mean ISR rate of 37.2% and 35.2%. Stent type (HR=1.64, 95%CI 1.26 to 2.14), stent diameter (HR=2.48, 95%CI 1.77 to 3.48), history of peripheral vascular disease (HR=2.17, 95%CI 1.17 to 4.00), history of transit ischemic attack (HR=1.45, 95%CI 1.05 to 2.14), and left-side involvement (HR=1.33, 95%CI 1.04 to 1.69) were included in the nomogram. The C-indexes at 6 and 12 months were 0.650 and 0.611 in the training set, and 0.713 and 0.603 in the validation set, respectively. Compared with low-risk patients, the intermediate- and high-level group had 1.46 (p=0.0235) and 2.28 (p<0.0001) higher chances of developing ISR in 2 years.

**Conclusions:** A nomogram and a risk evaluation table were developed with good predictive ability for in-stent restenosis among patients with VAOS, which could serve as a practical approach for individualized risk evaluation.

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## Endovascular Neurosurgery

ePoster presentation

Percutaneous transluminal angioplasty and stenting for vertebral artery stenosis

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**Objectives:** To assess the safety and efficacy of percutaneous transluminal angioplasty, with or without stenting, combined with medical treatment (MT), compared to MT alone, in people with episodes of cerebral ischaemia due to vertebral artery stenosis (VAS).

**Background:** To assess the safety and efficacy of percutaneous transluminal angioplasty, with or without stenting, combined with medical treatment (MT), compared to MT alone, in people with episodes of cerebral ischaemia due to vertebral artery stenosis (VAS).

**Methods:** We included all randomised controlled trials (RCTs) that compared endovascular treatment (ET) plus MT with MT alone in treating people aged 18 years or over with symptomatic VAS. We included all types of ET modalities. MT included risk factor control, antiplatelet therapy, lipid-lowering therapy.

**Results:** We included three RCTs with 349 participants with symptomatic VAS. There was no significant difference in 30-day post-randomisation deaths/strokes between ET plus MT and MT alone (risk ratio (RR) 2.33, 95% confidence interval (CI) 0.77 to 7.07). There were no significant difference between ET plus MT and MT alone in fatal/non-fatal strokes after 30 days post-randomisation to completion of follow-up (RR 0.51, 95% CI 0.26 to 1.01), ischaemic or haemorrhagic stroke during the entire follow-up period (RR 0.77, 95% CI 0.44 to 1.32), death during the entire follow-up period (RR 0.78, 95% CI 0.37 to 1.62), and stroke or transient ischaemic attack (TIA) during the entire follow-up period (RR 0.65, 95% CI 0.39 to 1.06).

**Conclusions:** This Cochrane Review provides low- to moderate-certainty evidence indicating that there are no significant differences in either short- or long-term risks of stroke, death, or TIA between people with symptomatic VAS treated with ET plus MT and those treated with MT alone.

## Education, Ethics, Socioeconomic

ePoster presentation

Resources mobilization for craniopagus surgery in a resource limited environment. The Ghana experience

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**Objectives:** To highlight strategies for resource mobilization for Craniopagus surgery in a developing country.

**Background:** On the 30 March 2021, Ghana recorded its first male Craniopagus classified as Total Vertical type III (TV, formerly O'Connell Types I-III) of Goodrich et al, with a surgical eligibility score of 26points on "Proposed Craniopagus classification scheme of Goodrich et al". Over 160 local health workers from public and private sectors, and some foreign experts chose to participate voluntarily without any form of incentives. Government support has been the fundamental success.

**Methods:** This study shares practitioners reflections on the dynamics and strategies in mobilizing human resources and pursuance for government to finance the entire project.

**Results:** The initial public approach through the Press and social media for funds converted the case into a national assignment with international support. Religious bodies played a Role. Hotel managers provided free accommodation to key local and foreign participants following in-person meetings and power point presentations. External collaboration for surgery performance in Ghana outweighed demands for children to be flown abroad. The involvement of all local neurosurgeons and some external experts constituted a base for frequent technical discussions.

The strategy to welcome anyone with goodwill led to public, private, security and quasi-government health professionals from diverse hospitals to teamed up with determination to voluntarily undertake a surgical procedure that lasted over year. Patient family support systems were instituted. Multiple meetings with the Minister for Health and other high government officials with explanations of all the above led to political and financial support with government providing all needed equipment and logistics.

**Conclusions:** Craniopagus surgery can last over a year and very capital intensive, requiring, state of the art equipment, logistics and different players. Strategic approaches can lead to Government funding. Equipment is being used to save many more lives beyond Craniopagus.

1725

## Functional

ePoster presentation

Awake neurosurgery for brain tumor excision with high precision technology. Ridge Hospital experience

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**Objectives:** To showcase benefits of awake craniotomy when combined with modern neurosurgical tools for tumour excision.

**Background:** Awake craniotomy for removal of intra-axial tumors within or adjacent to eloquent brain regions is a well-established procedure, is routinely practiced to avoid anaesthesia complication and other related cost. However, performing cartography, 3D printed of brain CT scans, use of neuronavigation for appropriate minimal craniotomy, brain stimulation, transoperative ultrasound and injection of tumour spy agent to discriminate tumour margins under surgical microscope fluorescence view is considered one of the best forms to improve quality of care from neurosurgical point of view.

**Methods:** Descriptive analysis of 17 patients who underwent awake surgery protocol. Preoperative cartography, preoperative clinical psychology evaluation and transoperative identification of objects was done. The craniotomy was planned with neuronavigation. Trans-operative ultrasound, brain stimulation and injection of fluorescein under microscope fluorescence view were performed. CUSA aided tumor resection in some cases.

**Results:** When regional nerve blocks are successfully performed under ultrasound guidance, patients do not complain of pain during surgery. Patients underwent surgical intervention with complete macroscopic tumour excision. Minimal or no complications were recorded. All features improved post operatively. Patients were discharge between 2- 7 days following surgery and referred for adjuvant therapy. Better preservation of motor and speech functions, shorter hospitalization and a reduced postoperative neurologic deficits were achieved.

**Conclusions:** Awake surgery with necessary modern neurosurgical tools help for total macroscopic tumour excision and improves patient survival. Adequate regional block is required for effective intraoperative pain control and better patient satisfaction. Appropriate patient selection, perioperative psychological support, and proper anaesthetic management for individual patients in each stage of surgery are crucial for procedural safety and success. With the use of high technology equipment, the exact location of the lesions is possible through optimal key hole craniotomy for tumour excision.

1726

## Skull Base

ePoster presentation

### Minimally invasive retro sigmoid approach for large CP angle tumor

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**Objectives:** To evaluate the feasibility of minimally invasive retro sigmoid approach and its advantages in reducing post operative complications as compared to standard retro sigmoid approach.

**Background:** Standard retro sigmoid approach is the most versatile corridor for the resection of CP angle tumors or Vestibular Schwannoma for all tumor sizes, but the literature and our institutional experience reveals that it's associated with significant complications like post operative headache, neck pain, CSF fistula, etc. Minimally invasive retro sigmoid approach might improve the post surgical outcome and patient's quality of life.

**Methods:** 48 large CP angle lesions were operated by minimally invasive retro sigmoid approach during January 2016 to October 2022 in our institution. Size of craniotomy, angle of table tilt, ease of surgical technique, extent of tumor resection, preservation of facial nerve function and post operative outcome were recorded and analyzed.

**Results:**

Gross total excision achieved in 41 cases and near total excision in 7 cases where tumor could not be separated from facial nerve or brainstem. Facial nerve function could be preserved in 84% patients of vestibular schwannoma. Angle of table tilt on either side was slightly higher (by 10 degree) than the standard technique. No surgical site complications noted in our series. Average post op hospital stay was 2.5 days.

**Conclusions:** Minimally invasive retro sigmoid approach is feasible even for larger CP angle tumors without compromising the general principles of micro neurosurgery.



1732

## Spine

ePoster presentation

### Management of lumbar spine surgery under epidural anesthesia

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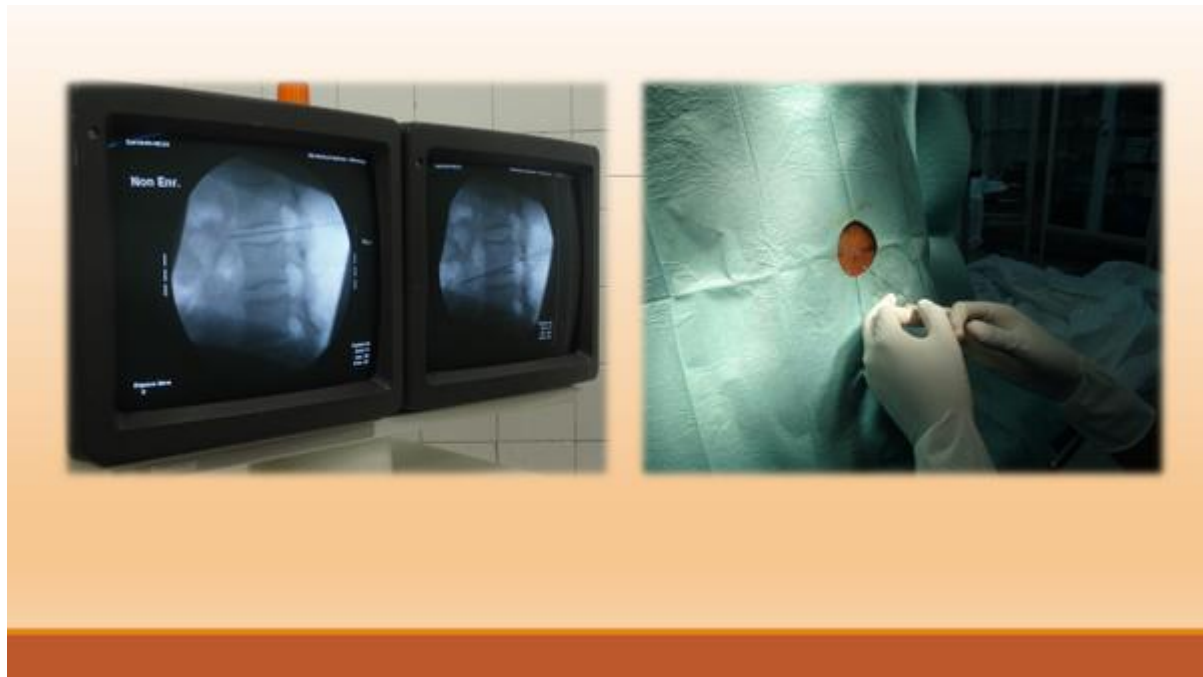
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**Objectives:** To report the results of our experience with more than 350 patients in whom epidural anesthesia was used in the great majority.

**Background:** Evaluation of the efficacy of epidural anesthesia for elective lumbar spine surgery.

**Methods:** A prospective study between March 2017 and October 2021, a total of 371 patients underwent lumbar spine surgery under epidural Anesthesia at Clinique Ngaliema in DRC.

EA was typically administered with the patient in sitting position, on operating room table, monitoring ECG, BP and pulse oximeter.



**Results:** C arm use for localization of the level of anesthesia

Local infiltration of 2ml of 2 percent lidocaine, EA achieved via lumbar puncture using needle size 25 most commonly, the anesthesiologist insert the catheter and inject Ropivacaine 0, 75 ml plus 10 Microg of sulfentanil.

Once the anesthetic agent had been given, the patient were rolled into a supine position on the stretcher for 20 to 30 minutes,

After confirming that a satisfactory level had been achieved the patient were turned into prone position onto the operating table,

And surgery started.

For all patients the back was prepped and draped and decompression procedure carried out,

- All procedure were open and C-arm obtained to confirm the spinal level
- for laminectomy no microscope used
- For minimal invasive discectomy and unilateral laminotomy we use a Metrix System and microscope

**Conclusions:** Epidural anesthesia proved to be a safe, for elective lumbar spine surgery .

- In this retrospective study of 371 patients undergoing lumbar spinal surgery, EA was associated with:
- Shorter operative time,
- less operative blood loss,
- Shorter anesthesia time, and
- Shorter duration of hospital stay.

Patients and surgeon satisfaction.

1733

## Paediatric

ePoster presentation

### Schizencephaly in a child with neurofibrotosis type I: case report

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**Objectives:** Our aim was to describe a rare case of association of congenital malformation and an autosomal abnormality.

**Background:** Neurofibromatosis is a common autosomal dominant neurocutaneous disease characterized by multi systemic involvement. In addition to some characteristics, physical manifestations such as nerve sheath, tumor and pigmentation changes, it can also be associated with certain brain abnormalities and cognitive impairments but the association with developmental abnormalities such as schizencephalie is very rare.

**Methods:** We report a case of an 8 month old female child brought in by the parents with 2 months history of enlarged head.

**Results:** On examination, the child had large "café au lait macules" all over her body and Lisch nodules without any sign of intracranial hypertension. She underwent a Brain CT scan and a fundoscopic exam. CT scan showed a cystic mass lesion with large cleft that extended from left lateral ventricle to the cortical surface of the cerebral parenchyma, strongly in favor of a schizencephalia. The fundoscopic exam was normal.

**Conclusions:** It's a rare pediatric case showing that NF1 can be associated with some brain congenital abnormalities and a conservative management was done about the macrocrania and close follow up with daily head circumference measurement.

1734

## Global Neurosurgery

ePoster presentation

Taskshifting and tasksharing in neurosurgery – the Gambia experience

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**Objectives:** To describe tasksharing and taskshifting in neurosurgery in Edward Francis Small Teaching Hospital of The Gambia.

**Background:** Neurosurgical task shifting and task sharing (TS/S), delegating clinical care to non-neurosurgeons, is ongoing in many hospital systems in which neurosurgeons are scarce. We report our preliminary data and experience on this emerging concept.

**Methods:** We conducted a retrospective analytic study of all the Neurosurgery cases operated in Edward Francis Small teaching Hospital by non Neurosurgeons trained by the Neurosurgeon and their outcome.

**Results:** A total number of 53 cases were done with 30 males and 23 females and 30 Pediatric and 23 adults. The most common procedure done was ventriculoperitoneal shunt insertion 14 cases followed by burrhole 13 cases.

**Conclusions:** The need for task sharing / task shifting to solve the burden of neurosurgical conditions in resource limited countries has been shown in this study.

1736

## Education, Ethics, Socioeconomic

ePoster presentation

### Gender disparity in Congolese neurosurgery

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**Objectives:** Our goal was to study the gap between number of male and female neurosurgeons in DR Congo.

**Background:** The specialization in neurosurgery is not only of the most prestigious but also one of the most demanding specializations in medicine. It requires long hours spent in the operating room and at the bedside of patients.

Up until 2020, the DR Congo did not have a center of specialization in neurosurgery for training. Therefore, any Congolese who wished to specialize in the field was obligated to go abroad. This explains the small numbers of neurosurgeons currently present in the DRC.

**Methods:** We conducted a study on the gender distribution in Congolese neurosurgery, including women practicing in the DRC and having a certified qualification in neurosurgery and those pursuing their specialization outside the DRC but with the ambition of returning to the country at the end of their training.

**Results:** In DRC, among the 19 permanent neurosurgeons residing in the country, only two are women. There are 17 Congolese currently in neurosurgery training in 06 countries worldwide. Among them, only 3 are women, representing only 17.6% of the total numbers of the ones in training in neurosurgery.

The Congolese neurosurgery society is campaigning for all regions of the DR Congo to be covered by at least one neurosurgeon, with a goal to triple that number by 2030. To achieve this, the aforementioned society encourages young doctors in general, especially young ladies who are interested in neurosurgery to undergo specialization training in order to reduce the gender gap.

**Conclusions:** The DR Congo is a big country with a population increasing fast from 90 million in 2021 to around 110 million in 2023. With such a big number we need more neurosurgeons and women should focus more on this speciality.

1737

## Global Neurosurgery

ePoster presentation

Evolution of neurosurgery in resource poor setting - the Gambia experience

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**Objectives:** To describe how neurosurgery started and the factors that contributed to its evolution and development to the current state.

**Background:** Neurosurgery has always been considered a luxurious speciality and as a result governments in Sub-saharan Africa and institution rarely invest in its development leaving the pioneers all alone with little or no support. Factors contributing to the above includes: Human resources ( neurosurgeons, etc), Equipment ( Microscopes, bipolar, consumables etc ). Starting a Neurosurgery unit in Sub Saharan Africa is faced with considerable challenge of materials. These materials consumables and implants can either be made available by the Government, Non government organisation, Charity Organisations, International collaborations and support groups.

**Methods:** We conducted a retrospective descriptive study from 2014 till 2023 in the Neurosurgery Unit of Edward Francis Small Teaching Hospital. How neurosurgery evolved and the main contributors.

**Results:** Starting Neurosurgery in The Gambia in 2014 as a Senior Registrar, all that was available was a monopolar and a basic set and orthopedic screws and plates that were not the proper spine instrumentation sets. 1 Neurosurgeon : 2 million population with little or no support from the Government, Gambia Neurosurgery has now developed to have the following. Human resource : a. two neurosurgery residents in training and one in China through CAANS, an OR nursing team, A tasksharing, taskshifting, informal training among others. b. Equipment ( Operating microscope, bipolar, C arm, Shunts, Microsurgery set, Spinal implants, sonopet, neuroendoscope). This was largely achieved by local and international collaborations like SANC, KBNF etc.

**Conclusions:** The role of international collaborations in the development of Neurosurgery in Sub saharan Africa and commitment from support groups is one sure way of ensuring a good evolution and advancement of Neurosurgery in low income countries. These can substitute the Government and local whose support is mostly inadequate.

1742

## Skull Base

ePoster presentation

### Nursing in PAs

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**Objectives:** Nursing care for pituitary tumor.

**Background:** Pituitary adenomas (PAs) account for 15-20% of intracranial tumors and are the third most common, following glioblastoma and meningioma. In the present era, these lesions are usually managed surgically, and due to rapid advancement in surgical technologies, the endoscopic endonasal transsphenoidal (ETSS) approach has become a popular technique for surgical removal of these tumors. The surgical management of PAs should be performed by a multidisciplinary team and nurses possess an important.

**Methods:** In this clinical trial, we randomly divided PA patients who were candidates for ETSS between April 2021 and April 2023 into two groups. One group received routine nursing care and the other received care from nurses who were trained for ETSS. Subsequently, pain, acute confusion, nasal bleeding, aspiration, constipation, electrolyte imbalance, fatigue, self-rating anxiety scale (SAS), and a self-rating depression scale (SDS) were evaluated.

**Results:** The pain, SAS, SDS, aspiration, constipation, and electrolyte imbalance were significantly lower in the trained nursing care group than in the routine care group ( $P < 0.05$ ). The incidence of nasal bleeding, acute confusion, and fatigue were not significantly different ( $P > 0.05$ ).

**Conclusions:** Our finding suggested that training nurses for postoperative care is associated with a more favorable outcome.

1743

## Trauma

ePoster presentation

Surgical site infections following the surgical timing for depressed skull fractures in a sub-Saharan tertiary-hospital: bacteriological and antimicrobial susceptibility patterns

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**Objectives:** To determine bacteriological and antimicrobial susceptibility patterns in SSI following the timing of debridement and elevation of depressed skull fractures (DSF) from Mulago Hospital in Uganda.

**Background:** Surgical site infections (SSI) remain a major cause of morbidity and mortality following surgery for traumatic brain injury (TBI). The development of SSI from cranial neurosurgical procedures represents a significant threat to life and often requires immediate medical/surgical intervention. The timing of surgery and the patterns of infection remain a big challenge in the management of stable TBI patients with DSF.

**Methods:** This was a prospective cohort study that was carried out in neurosurgical wards of Mulago Hospital. Patients were recruited from the emergency department within 24 hours of injury and followed up perioperatively to record the incidence of SSI according to WHO criteria. During dressing changes, we swabbed any discharge from surgical sites aseptically and processed as per standard operating procedures in appropriate culture media. We performed susceptibility testing on Mueller Hinton agar.

**Results:** A total of 108 patients were enrolled with mean-age=23.6 years and 92.6% males. The prevalence of SSI was 16/108(14.8%), mainly superficial SSI, and relatively high among patients operated on after 48 hours of injury. Gram-negative microorganisms constituted the highest number of isolates with 11/17(64.7%). There were 4/17(23.5%) *enterococcus* species and 2/17 (11.8%) *S. aureus* Gram-positive bacteria isolated. Among the Gram-negative microorganisms, *Escherichia coli* species 4/17(23.5%) and *K. pneumoniae* 4/11(23.5%) were predominant isolates. Deep SSI was associated with *E. coli*. Gram-positive isolates showed resistance to most of the commonly prescribed antibiotics.

**Conclusions:** The prevalence of SSI was relatively high after delayed surgery of DSF with the predominance of Gram-negative bacteria in the isolates with at least two antibiotics resistance patterns. We recommend early surgical intervention for DSF, especially the compound types, with strict infection control measures to reduce SSI and revise antibiotherapy protocol.



1745

## Neurovascular Surgery

ePoster presentation

Endarterectomy versus stenting in patients with symptomatic severe carotid stenosis at high risk for both procedures

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**Objectives:** This study aims to compare incidence of procedure related stroke or death for carotid endarterectomy (CEA)

versus carotid artery stenting (CAS) among patients with symptomatic severe carotid artery stenosis and defined preoperative risk factors common to both procedures.

**Background:** Carotid artery stenting (CAS) has emerged as a less-invasive alternative to CEA for high surgical risk patients. These surgical risk factors have been defined in randomized trials previously. Growing experience has also identified systemic and anatomical prognosticators for poor outcomes following CAS. Although both CEA and CAS share many common anatomic and systemic risk factors, little is known on the comparative safety and efficacy of these two methods of vascularization among patients considered high-risk for both procedures.

**Methods:** We conducted a retrospective cohort study of patients with symptomatic, severe carotid stenosis who underwent either CEA or CAS from January 1st, 2007 to March 31st, 2018. Each patient chart was reviewed to verify that data relating to baseline characteristics, factors that defined patients as high-risk for either procedure, and adverse events related to or after the procedures was documented in the system. Shared high-risk features for both revascularization procedures were separated into anatomic and systemic categories.

**Results:** 77 patients who underwent CEA had high-risk features for CEA and 62 patients who underwent CAS had high-risk features for CAS. There was overlap in risk factors for 47 patients, and these were ultimately included in the analysis. Systemic risk factors did not vary significantly between patient cohorts. A greater proportion of patients with both anatomic and systemic risk factors received CAS instead. The rates for adverse perioperative outcomes did not vary significantly between CEA and CAS groups.

**Conclusions:** The risk of iatrogenic stroke or death in these “doubly high-risk” groups are higher than the quoted risks of either procedure in a general risk patient population.

1747

## Global Neurosurgery

ePoster presentation

The 5-Factor modified frailty index in unruptured cerebral aneurysm and meningioma surgery

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**Objectives:** To investigate the association of the mFI-5 score with worse outcomes, mortality, and complications in patients after surgery for UCA and meningioma by chronological age groups using a Japanese national database.

**Background:** Although chronological age is associated with mortality and morbidity after surgery for unruptured cerebral aneurysms (UCAs) and meningioma, there is little evidence regarding an association between the simplified 5-factor modified frailty index (mFI-5) and postoperative outcomes based on age group.

**Methods:** The study enrolled in a Japanese national database between 2011 and 2015. Age group (<65, 65-74, and ≥75 years), sex, UCA and meningioma location, treatment, medications, Barthel Index (BI), medical history, mFI-5 score, as well as in-hospital mortality and complications were evaluated. We identified risk factors for worsening BI score, in-hospital mortality, and overall postoperative complications in each age group.

**Results:** In total, 14,465 UCA and 8,138 meningioma patients were enrolled in this study. Multivariable analysis showed that elderly groups and patients with an mFI-5 score ≥2 items were associated with worsening BI scores (odds ratio [OR] 1.95; 95% confidence interval [CI] 1.52–2.51) and in-hospital complications (OR 1.79; CI 1.49–2.15), despite having no association with in-hospital mortality. Multivariable analysis by age groups showed that the mFI-5 score ≥2 items was associated with in-hospital complications in all age groups, unlike chronological age in patients aged under 74 years in UCA.

**Conclusions:** The mFI-5 score was a more useful associated factor of in-hospital complications than chronological age in patients aged under 74 years undergoing surgery for UCA. Although the mFI-5 scores could predict the risk of in-hospital worsening outcomes, mortality, and complications, it was more useful in non-elderly patients aged < 65 years rather than in elderly patients aged ≥ 75 years, contrary to chronological age.

1748

## Neurovascular Surgery

ePoster presentation

Visualization of nonlinear correlation between age and poor outcome in subarachnoid hemorrhage

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**Objectives:** The aim of this study was to quantitatively validate the prediction models that allow visualization of the non-linear correlation between age and poor outcome in patients with aneurysmal SAH using separate cohort.

**Background:** Previously, we qualitatively visualized the non-linear correlation between age and poor outcome in patients with aneurysmal subarachnoid hemorrhage (SAH). However, these models were not validated in an independent cohort.

**Methods:** Patients who experienced aneurysmal SAH and were treated via surgical clipping or endovascular coiling from 2003 to 2009 were included from the Japanese Stroke Databank (derivation cohort) and the 'Predict for Outcome Study of Aneurysmal Subarachnoid Hemorrhage' (validation cohort). Generalized additive models (GAMs) for poor outcome, defined as modified Rankin Scale score at discharge  $\geq 3$ , were fit where age was transformed using spline curves in each World Federation of Neurological Societies (WFNS) grade. The independent variables were WFNS and age with (adjusted model) or without (unadjusted model) other patient features. The discrimination property and calibration plot of both models were evaluated against the validation cohort. The correlation between age and poor outcome was visualized.

**Results:** In total, 3,610 and 3,251 patients were enrolled in the derivation and validation cohorts, respectively. Concerning discrimination, in the unadjusted model, the areas under the curve (AUCs) were 0.835 and 0.827 for the derivation and validation cohorts, respectively. In the adjusted model, the AUCs were 0.844 and 0.836. An unbiased correlation was confirmed between the predicted and observed probability of poor outcome.

**Conclusions:** The GAM displayed good discrimination and calibration properties and could clearly help visualize the relationship between age and clinical outcomes in patients with aneurysmal SAH, which can aid clinical decision-making.

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## Neurovascular Surgery

Oral presentation

Relationship between oral and intestinal bacteria and the onset of subarachnoid hemorrhage: SAH-FLORA Japan study, protocol and preliminary result

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**Objectives:** To clarify the relation with bacteria and subarachnoid hemorrhage, we are now conducting prospective multi-center study creating biobank and analysis.

**Background:** Influence of oral and/or intestinal bacteria with the origin of cerebral aneurysm and its rupture have been recently interested.

**Methods:** We collected clinical data including food habits, saliva, stool and blood specimen of 175 cases (Subarachnoid hemorrhage:86, unruptured intracranial aneurysm:59, and reference (no history of stroke): 30cases). From saliva specimen, we cultured periodontoid bacteria and checked the incidence of *cnm+* Streptococcus Mutans, which is previously reported to be related with hemorrhagic cerebrovascular disease. For stool specimen, we have extracted DNA and analyzed bacteria using 16sRNA method and RDB, and DB (Technosuruga Co., Japan) library.

**Results:** We have cultured saliva of 171cases and found positive *cnm+* Streptococcus Mutans strain in 18 cases out of 74 positive *S. Mutans* cultures (24.3%). There was no difference in the positive rate between types of specimen. Stool flora analysis was done in 155 (SAH 79, UIA:53, REF:21) cases, and stool specimen from SAH patients showed dominancy of Fusobacteria Phylum. And Campylobacter group were frequent in SAH and UIA group compared to reference group.

**Conclusions:** We could not find difference in the positive culture rate of *cnm+* *S. Mutans* between types of specimen. Some organisms specially found from stool specimen of SAH patients were reported to be responsible for necrotizing disease. Relationship between stool bacteria and onset of subarachnoid hemorrhage is yet to be clarified including blood bioproduct analysis. Also at the same time, we are trying to find difference of oral and stool flora between European and Japanese population, where incidence of subarachnoid hemorrhage is 3times higher.

1751

## Spine

ePoster presentation

Does aggressive treatment make benefit for patients with spinal metastasis in years lost due to disability?

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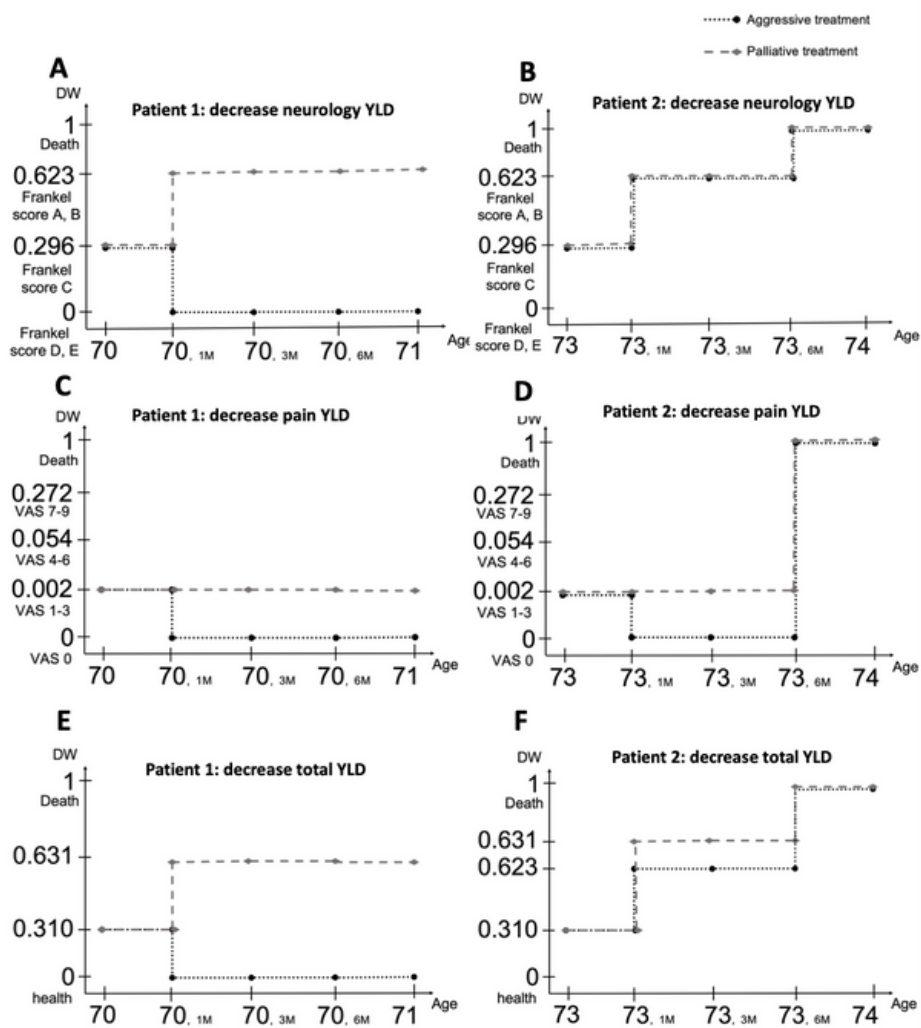
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**Objectives:** The aim of this study is to determine whether aggressive treatment decrease years lost due to disability(YLD) in SM patients and factors between cost-effective and non-cost-effective group.

**Background:** Pain and neurologic deficits associated with spinal metastasis(SM) devastated life quality of the patients. Aggressive treatment including surgery could relieve pain and prevent neurological deficit, but the high cost and the short, expected survival time rose the cost-effectiveness issue in decision-making.

**Methods:** This is a retrospective cohort study. We reviewed 41 patients who underwent aggressive treatment in our center from 2016 to 2021. For YLD and cost analysis, we hypothesized a worst-case model in which no operation and medical treatment occurred. The discrepancy of YLD and cost between aggressive and palliative treatment during admission and postoperative 1 year follow up was calculated for each patient. Patients were divided into cost-effective and non-cost-effective group.

**Results:** The mean(SD) of YLD of aggressive and palliative treatment was 0.05(0.10), and 0.19(0.25), respectively, and aggressive treatment decreased 0.14YLD. The discrepancy of costs was \$13966(6456). There were 13 patients defined as cost-effective and 28 patients as non-cost-effectiveness. The cost-effective group were characterized as better preoperative performance status(PS), more involved in cervical/thoracic region, lower spinal instability neoplastic score, better predict survival outcome by Tomita score/revised Tokuhashi score and high risk of deterioration base on image study/SM location.



**Conclusions:** Aggressive treatment is cost-effective, especially in patients with better preoperative PS, more stable spine condition, high risk of deterioration base on image study/SM location and longer predicted survival time.

1753

## Trauma

ePoster presentation

Surgical management of chronic subdural hematoma: single hole technique versus two-hole technique combined with drainage and irrigation

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**Objectives:** The objective of our study was to evaluate the type of churgical technique between the one-hole technique and the two-hole technique associated with drainage and irrigation.

**Background:** Chonic subdural hematoma (CSDH) is a common pathology encountered by neurosurgeons worldwide.

**Methods:** We performed a retrospective analysis of 66 consecutive patients with CSDH admitted to the Ngaliema clinic from January 2019 to March 2021 in group: the single-hole technique and the two-hole technique. Patient data including age, sex, medical history, brain CT scan, and results, were analyzed.

**Results:** During the study period 66 patients with CSDH were admitted. The average was 48 years and sex ratio of 1 M/0,6 F. Eighty-one percent of hematomas were treated with two burr holes while the remaining 19 % were treated with one burr hole. About 98,3 % of patients improve after the operation. The mortality rate was 1,7 %.

**Conclusions:** CSDH is a common pathology in neurosurgery that must be taken into account when deciding whether surgical treatment is indicated. This study detected no difference in outcomes between the single burr hole technique combined with irrigation and drainage group and the two burr hole technique combined with irrigation and drainage group.

1754

## Paediatric

ePoster presentation

Complications of ventriculo-peritoneal shunting: 13 years of experience in a Sub-Saharan paediatric neurosurgery unit

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**Objectives:** To highlight this surgical and social challenge, to assess the progress made and to analyse the experience of a paediatric neurosurgical unit in care of hydrocephalus-related complications, in order to link them to international standards while adapting them to the working context.

**Background:** Complications of ventriculoperitoneal shunting in hydrocephalus cure are countless and well known nowadays; depending on several factors. They are all more so screened in children whom are vulnerable and growing; more again in sub-Saharan area, suggesting a close follow-up and a paid attention on family balance.

**Methods:** A retrospective study has been performed to determine statistical data over 13 years of our practice in sub-Saharan hospital area, referring to international recommendations.

**Results:** It was of above 90 complications collected in 62 patients over 302 children operated, 20.52%. Complications were mechanic (58) and infectious (32). The mean age of appearance was 2 years 8 months, with an average of 6 months of follow-up. Sixteen children deceased during the study period.

**Conclusions:** The challenge in sub-Saharan area remains the efficient management of complications with limited resources or a sociocultural family uncertainty. Emphasis must be done unto operative prevention.



1756

## Functional

ePoster presentation

Spinal cord stimulation for back and leg pain - fad or rad, what does the long-term real world data show?

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**Objectives:** This study aimed to look at the real world long term outcomes of patients with HF10 (10 KHz) spinal cord stimulation for both persistent spinal pain syndrome (PSPS) type 1 and 2.

Here we present the 8 year follow-up data from a single centre in the UK, Southampton.

**Background:** High frequency spinal cord stimulation is being used across Europe based on the Senza-RCT results, to treat both chronic intractable leg and back pain. This retrospective clinical study aimed to evaluate high frequency spinal cord stimulation therapy in patients with chronic intractable back and leg pain and evaluate the long-term follow-up data.

**Methods:** The study evaluated and documented the clinical performance of HF10 therapy, in patients with chronic intractable leg and back pain, as per the centre's routine practice. It is a proof of principle study to evaluate real-world use and see if the effects of spinal cord stimulation stand the test of time.

**Results:** 521 patients had a spinal cord stimulator implanted over the 8 year period studied - 2015-2022. 107 were either lost to follow-up or excluded due to missing data. All patients were contacted via telephone with the longest follow-up period being 8 years. The mean follow-up was 4.3 years (SD 2.1 years) with 307 of the 414 patients having HF10 stimulation. The stimulator was considered successful if there was >50% reduction in their visual analogue scale (VAS). Of the 307 patients with HF10 SCS, 109 patients no longer had sufficient leg pain relief meaning a sustained success rate of 198/307=64.5%. For back pain, 186/307=60.6% of patients had sustained prolonged success. As mentioned before the mean follow-up for both results was 4.3 years (SD 2.1). Similar reductions in ODI and EQ5D were also sustained long-term.

**Conclusions:** HF10 spinal cord stimulation works long-term for both back and leg pain.

1758

## Trauma

ePoster presentation

### Autonomic dysfunction following mild head injury

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**Objectives:** To study the natural history and outcome in cases of dysautonomia following mild head injury.

**Background:** The literature on traumatic brain injury and dysautonomia are on small series of case reports or on anecdotal responses to a particular drug therapy. Minimal attention has been paid to the natural history, patterns of physiological changes, or outcomes of patients with dysautonomia. The limited outcome data indicates a poor functional prognosis. Therefore, the aims of this study were to better establish the natural history of dysautonomia in series of patients and their outcome in mild head injury.

**Methods:** This study was a retrospective observational study of 20 patients at tertiary center with mild head injury who had features of dysautonomia. All the patients with GCS 13-15 were taken into consideration, irrespective of CT findings. However, the patients with pre-existing seizure, head injury, psychiatric illness or any other injury was excluded from the study. The definition used for dysautonomia was paroxysmal increase in heart rate, respiratory rate, core temperature, and blood pressure, with posturing, increased muscle tone, and profuse sweating. These patients were compared with the control of age and sex matched using Glasgow outcome score (GOS) and functional independence measure (FIM) score at 10d, 1 month and 6 months.

**Results:** The patients with dysautonomia group worse outcome in form of increase ICU Stay, prolong ventilation, multidrug resistant infections, multiple blood transfusion. These factors showed low GOS score and FIM score.

**Conclusions:** These features of paroxysmal tachycardia, temperature, tachypnoea are associated with poor outcome in severe head injury, however this study shows that there is poor outcome in mild head injury also. The early recognition of these features may help in better outcome. However considering the sample size it requires further study.

1759

## Oncology

ePoster presentation

Hourglass neuroma

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**Objectives:** The surgical strategy for a neuroma located in the mid or lower cervical spine is more complicated and the selection of the most appropriate approach remains controversial. We report an exceptional case of intradural, extradural and paravertebral spinal neuroma of the second cervical vertebra. This is a 57-year-old woman who presents with a laterocervical mass and functional impotence of four limbs for 5 months, with reduction in the perimeter of steps, in whom we note a spinal syndrome and spastic tetraparesis with a pyramidal syndrome in the four members. The posterior approach was used. MRI is currently the main imaging examination allowing not only an early positive diagnosis but also the differential diagnosis and especially the surgical planning.

**Background:** Case report

**Methods:** Case report

**Results:** Case report

**Conclusions:** Case report

1761

## Spine

ePoster presentation

Multilevel spinal stabilization as a treatment for Hirayama disease: report of an experience with six cases

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**Objectives:** To analyze the role of multisegmental spinal instability in the pathogenesis of Hirayama disease.

**Background:** Multilevel Spinal Stabilization as a Treatment for Hirayama Disease.

**Methods:** From June 2014 to December 2017, the authors managed 6 patients with Hirayamadisease. The patients were diagnosed on the basis of classical described radiologic and clinical guidelines. All 6 patients were treated with multilevel cervical fixation that included fixation of the atlantoaxial joint in 5 patients by the adoption of the facet fixation methods. No dural or bone decompression was performed. The follow-up ranged from 7 to 48 months (average 23 months).

**Results:** The most remarkable feature was an immediate postoperative and progressive improvement in the symptoms of weakness, wasting, and deformity of hands in all patients. The other remarkable feature was an immediate postoperative reduction in extradural mass in all patients and its complete disappearance in 2 patients.

**Conclusions:** From the observations, it appears that atlantoaxial and subaxial spinal instability plays a major role in the pathogenesis of Hirayama disease.

1763

## Oncology

ePoster presentation

How much is the maximum safe resection of sphenoid wing enplaque meningiomas for an acceptable low risk of recurrence?

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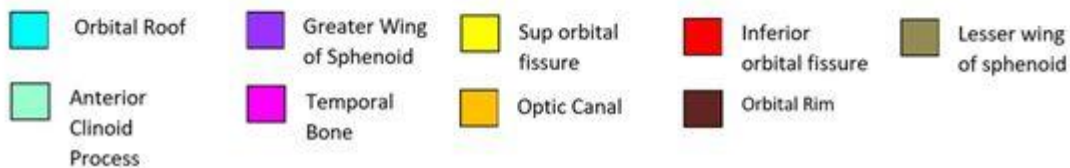
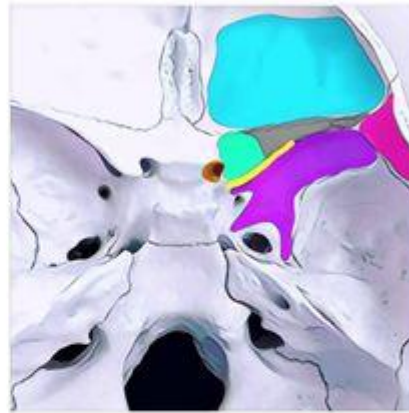
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**Objectives:** Defining different anatomical components of sphenoid wing involving by en-plaque meningioma (EPM) and evaluating recurrence rate could guide to estimate maximum safe resection borders leading to acceptable long term outcomes.

**Background:** EPM is an infiltrative tumor that commonly involves the greater wing of sphenoid bone. Due to involvement of an important crossing point of neurovascular elements (Orbit and middle fossa), complete resection of tumor is a challenge, and accordingly, the recurrence rate is also affected.

**Methods:** 22 patients with sphenoid wing EPM who underwent tumor resection at Rasoul Akram Hospital between 2014 and 2020 were included. Anatomical components of sphenoid wing, orbital walls and middle fossa divided into 9 groups (figure) and then the involved areas were identified in each of the patients. The extent of resection -as long as it didn't cause neurovascular damage- determined by postoperative imaging 2 months later and patients followed for

3 years for any sign of recurrence annually.



**Results:** In the preoperative imaging, 5 anatomical components had the highest rate of involvement by the tumor consist of sphenoid wing, superior orbital fissure (SOF), orbital roof, dura matter, and lateral orbital wall. Three anatomical components had the highest rates of tumor remnant which were seen in inferior orbital fissure (IOF), anterior clinoid process and cavernous sinus in the 2-month follow-up imaging. Only one patient experienced tumor recurrence 2 years after surgery in whom cavernous sinus and IOF were involved by the tumor on the first postoperative evaluation.

**Conclusions:** Although recurrence in areas with tumor remnant is possible, due to lower risk of complications by limiting extent of resection to optic canal, sphenoid wing, SOF, orbital roof and lateral orbital wall, it seems that not invading cavernous sinus and IOF is reasonable border of resection to achieve acceptable outcomes.

1764

## Neurovascular Surgery

ePoster presentation

Comparison of 3 types of abnormal muscle response in hemifacial spasm surgery

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**Objectives:** This study aims to assess the reliability of different intraoperative electrophysiological monitoring methods, such as Modified abnormal muscle response (mAMR), Dual abnormal muscle response (dAMR), and the combined mAMR and dAMR, in guiding decompression surgery for hemifacial spasm (HFS). Our specific goal is to compare their ability to detect abnormal muscle responses (AMR) and predict long-term relief after HFS surgery, focusing on sensitivity, specificity, and overall accuracy.

**Background:** Intraoperative electrophysiological monitoring in hemifacial spasm (HFS) surgery can be valuable. We evaluated three **Methods:** Modified abnormal muscle response (mAMR), Dual abnormal muscle response (dAMR), and combined mAMR and dAMR, comparing their sensitivity, specificity, and accuracy.

**Methods:** A retrospective analysis of 62 adult patients with hemifacial spasm treated by surgery was conducted between September 2018 to September 2022. All 62 patients underwent mAMR monitoring, dAMR monitoring and combined mAMR and dAMR monitoring.

**Results:** Typical AMR waveforms were detected in 47 (75.8%) patients in the mAMR group. However, the AMR waveforms were detected in 60 (100%) patients in the dAMR and combined mAMR and dAMR group ( $P < 0.00001$ ). The mAMR showed the sensitivity of AMR disappearance to judge the long-term relief after HFS operation was 83.3%; the specificity was 80%; the accuracy was 83.0%. The dAMR showed the sensitivity of AMR disappearance to judge the long-term relief after HFS operation was 87.0%; the specificity was 50%; the accuracy was 83.3%. The combined mAMR and dAMR showed the sensitivity of AMR disappearance to judge the long-term relief after HFS operation was 81.4%; the specificity was 66.7%; the accuracy was 80%.

**Conclusions:** Intraoperative electrophysiological monitoring methods including mAMR, dAMR and combined mAMR and dAMR monitoring all have good sensitivity, accuracy. However, mAMR has better specificity but much poor wave detection rate.

1768

## Endovascular Neurosurgery

ePoster presentation

Endovascular management of spinal dural AV fistulas as primary treatment – a paradigm shift

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**Objectives:** Spinal Vascular malformations are rare disorder with significant clinical implications. Surgical management was considered the treatment of choice, but with currently available microcatheters and liquid embolic agents, the paradigm is shifting to endovascular therapy to be the primary treatment.

**Background:** Surgery has been the treatment of choice but with current evolution of endovascular treatment, it is feasible to safely and effectively treat Spinal DAVF by minimally invasive methods.

**Methods:** We did a retrospective, observational, single-center case series on sDAVFs treated with endovascular embolization, microsurgical occlusion, or both between 2016 and 2022. The mode, efficacy, and clinical effect of treatment were evaluated.

**Results:** Twenty four patients with spinal dural arteriovenous fistulas were evaluated using spinal angiography, which demonstrated Type I sDAVFs (thoracic 15, lumbar 6, Sacral 1 and cervical 2). 19 were male (79%), and the median patient age was 54 years. Twenty two patients underwent primary endovascular embolization using 4 N-butyl cyanoacrylate [NBCA]), and Four underwent surgical treatment. (Two primary and Two embolization failure). Two cases were primarily selected for surgery as the Artery of Adamkiewicz arose from same radicular artery supplying the SDAVF. The Mean follow-up of 34 Wks by clinical assessment, angiography or MR angiography. Two patients treated with endovascular embolization demonstrated persistent arteriovenous shunting and all others remained occluded. 18 patients had significant clinical improvement (70%), while 6 patients (21%) experienced some resolution of their presenting symptoms.

**Conclusions:** Endovascular embolization is safe, effective, minimally invasive and primary modality of treatment for sDAVFs with surgical treatment reserved for few selected cases and those that fail endovascular treatment.



1773

## Spine

ePoster presentation

Cortical reorganization in cervical spondylotic myelopathic patients undergoing cervical surgery.  
A functional pilot study

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**Objectives:** To shed light on the pattern of functional reorganization before and after surgery in CSM patients trying to find possible prognostic factors and outcome markers.

**Background:** Cervical spondylotic myelopathy (CSM) is adults' most common cervical disorder. Chronic damage results in cortical and subcortical functional reorganization. This mechanism plays a key role in preserving neurological function.

**Methods:** This is a Prospective 2-Arms Pilot Study conducted at the neurosurgical department of Policlinico Universitario "Paolo Giaccone" in Palermo. We consider 10 HCs (health controls) and 10 CSM patients. The HCs are evaluated only radiologically by structural and functional MRI. In the CSM group, we obtain preoperative clinical (using the mJOA scale) and radiological (structural and functional MRI) assessments both at rest and while performing specific motor tasks. Follow-up (F-Up) time is set at 3, 6, and 12 months.

**Results:** The first outcome is to evaluate structural and functional baseline cortical and subcortical organization in CSM patients in comparison to HCs, using NODDI-MRI sequences and FSL software for white matter fiber bundle reconstruction, and analyzing volume of activation (VOA) in specific areas for function assessment. After, we similarly assess cortical and subcortical reorganization in patients undergoing surgery at early, middle, and long-term F-Up. The second outcome is to evaluate possible structural and functional prognostic factors.

**Conclusions:** Neuroplasticity allows functional impairment to be minimized. These neural changes can be used to build predictive models for surgical treatment. We explore possible correlations between surgery and the type of cortical and subcortical reorganization. This finding could be used to predict the outcome of these patients better and to set tailored neurorehabilitation programs.

1774

## Neurovascular Surgery

ePoster presentation

CVA-net: a hybrid deep learning approach for early prediction of malignant brain edema after ischemic cerebrovascular accident

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**Objectives:** To develop a deep learning model that combines demographic data, topographic characteristics, and volumetric data from Computed tomography (CT) scans to enhance the accuracy of malignant edema prediction and to evaluate the model's clinical effectiveness.

**Background:** Malignant cerebral edema following strokes is a severe and often fatal complication, necessitating urgent intervention like hemicraniectomy to prevent herniation. Current prediction methods rely on complex imaging techniques but have limitations in accuracy.

**Methods:** The study involved patients with ischemic cerebrovascular accidents, and out of the 300 patients assessed, 78 developed malignant edemas. A hybrid deep learning model was developed by integrating Convolutional Neural Networks and Long Short-Term Memory (LSTM) networks, combining both clinical and imaging data to predict patients requiring hemicraniectomy or facing fatality due to midline shift. The data collected included demographic and topographic patient information, such as serum glucose levels and tPA treatment. Additionally, an automated algorithm extracted imaging data from routine CT scans, focusing on metrics like cerebrospinal fluid (CSF) volumes and hemispheric CSF volume ratios.

**Results:** The model's performance was compared to existing models and the Enhanced Detection of Edema in Malignant Anterior Circulation Stroke (EDEMA) score, using accuracy, sensitivity, specificity, precision, and F1-score. The fully connected network performed similarly with a 33% precision rate, slightly better than the EDEMA score (28%). In contrast, the LSTM model showed improved performance, with a 96% recall rate and an 82% precision rate. The Light Gradient Boosting Machine (LightGBM) model excelled further, achieving a 98% recall rate and an 87% precision rate. The proposed model achieving remarkable results with a 100% recall rate and an 89% precision rate.

**Conclusions:** CVA-Net demonstrated its potential in effectively identifying patients requiring surgical intervention before their condition worsens, offering a promising application of artificial intelligence in the field of stroke management but further validation and clinical implementation are warranted.

1779

## Trauma

ePoster presentation

### Early neurorehabilitation after severe TBI in acute care

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**Objectives:** Early rehabilitation programs can be implemented not only in rehabilitation hospitals, but also in ICU and acute care. Especially early mobilisation including bed cycling, therapeutic verticalization, dysphagia therapy, multisensory stimulation are the main points in the therapy program.

**Background:** The aim of the study is to show the implementation of early rehabilitation programs for patients after traumatic brain injury in acute and ICU care and to evaluate the outcome after 12 and 24 months.

**Methods:** A total of 51 survivors (age 33.8, range 16-64 years, m:f = 4:1) of sTBI (GCS  $\leq$  8 for at least 24 hours) underwent a interdisciplinary early rehabilitation program. Duration of rehabilitation program was at mean 18,4 (4-78) days adapted to the individual capability for 3-4 hours/ day, until they were discharged from hospital. The follow-up examination took place 12 and 24 months after the STBI.

**Results:** Data revealed a high level of independence in activities of daily living (mean Barthel Index after one year 92.7 points, after two years 93.7 points). After one and two years, 74.5% and 80.4% of the patients, respectively, were completely independent of need for care. Return to work rates improved between one and two years after trauma, as evidenced by the rate of patients being back to full time work at one year (n=14, 28%) and two years (n=20, 40%) post-STBI, although none of these changes reached statistical significance.

**Conclusions:** In summary the successful implementation of early rehabilitation programs for patients after traumatic brain injury in ICU and acute care is possible. Focussed on outcome, the data revealed a high level of independence in activities of daily living. There are still changes in both impairment and disability related areas between one and two years post-STBI, but the degree of improvement is variable depending on the area being considered.

## Functional

ePoster presentation

The implication of persistent lateral spread response in hemifacial spasm surgery

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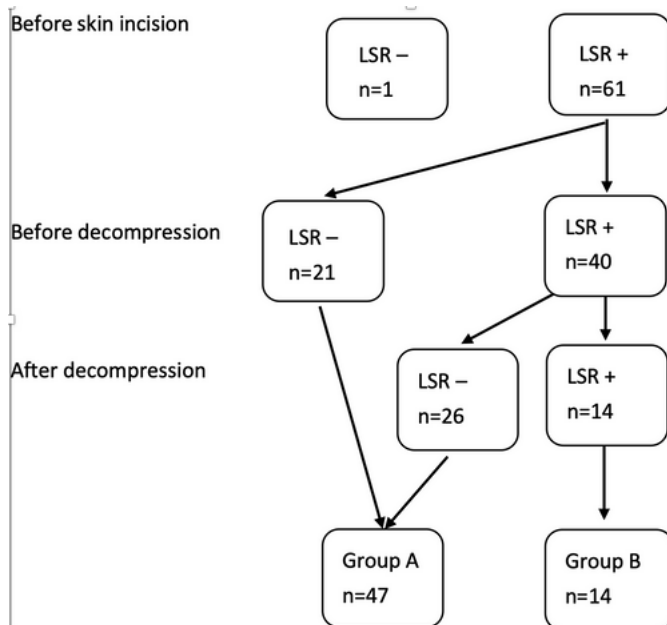
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**Objectives:** To understand the implication of persistent lateral spread response in hemifacial spasm surgery.

**Background:** Intraoperative monitoring (IOM) of lateral spread response (LSR) has been used to identify neurovascular conflicts and confirm adequate decompression in hemifacial spasm (HFS) surgery. Cessation of LSR signal after microvascular decompression may boost confidence of surgeon during HFS surgery. On the contrary, persistent LSR following decompression procedure may annoy and confuse the surgeon. It is important to understand the implication of persistent LSR in order to improve outcome of patient with persistent LSR.

**Methods:** We retrospectively analyzed 62 adult HFS patients who underwent microvascular decompression during the period of September 2018–September 2022. We employed IOM combining traditional LSR (tLSR) and dual LSR (dLSR). One patient was excluded owing to the lack of LSR induction throughout the surgery, while 61 patients were divided into groups A (n = 47) and B (n = 14), designated as LSR loss or LSR persistence groups respectively, and offending vessels were analyzed.



**Results:** The mean age of group A patients was significantly younger ( $49.8 \pm 10.4$ ) than that of group B ( $57.4 \pm 7.2$ ) ( $p = 0.01046$ ). The gender of group A was female predominant in contrast with male predominant in group B ( $p = 0.00477$ ). The significant predominating offending vessel in group A was the anterior inferior cerebellar artery (AICA, 55.3%) in contrast with vertebral artery (VA) involved (35.7%), and combined AICA and PICA (35.7%) in group B. Besides, there are more revision surgery in group B than group A ( $p=0.02996$ ). Group B exhibited unfavorable clinical outcomes compare to group A.

**Conclusions:** Persistent LSR may occur more frequently in older and male populations. Persistence of LSR implied unfavorable prognosis may attribute to more difficult surgical condition with complicated offending vessel.

1783

## Neurovascular Surgery

ePoster presentation

Usefulness of intraoperative neuromonitoring for evaluating cerebral tissue perfusion during temporary clipping in aneurysm surgeries

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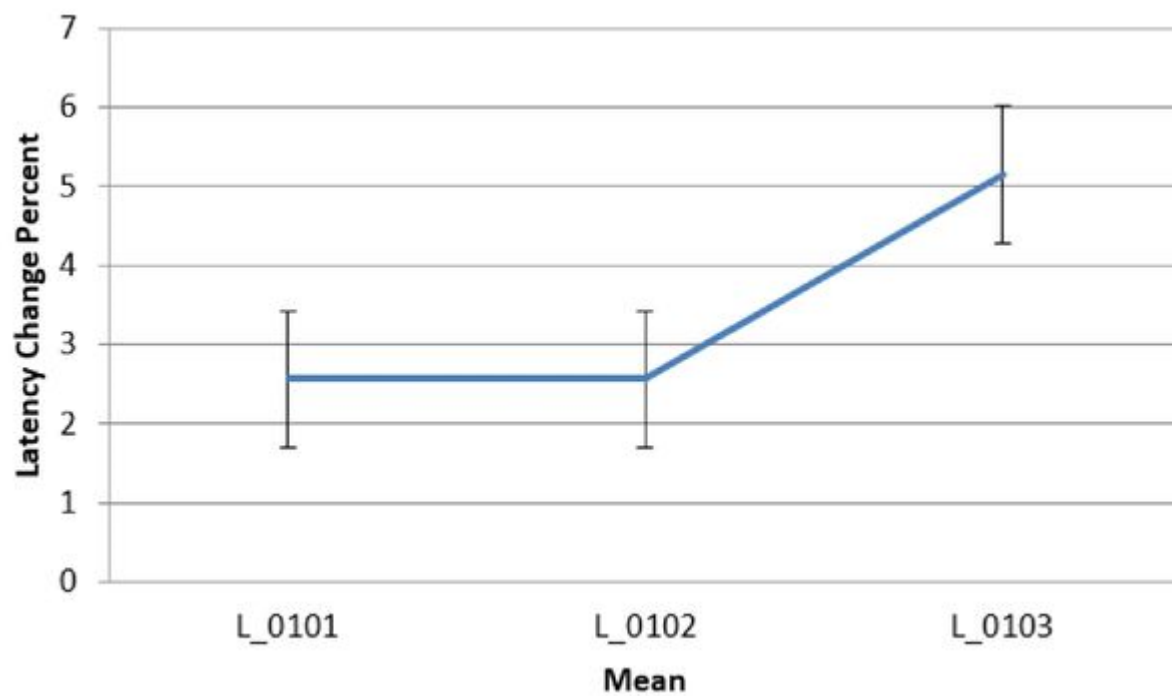
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**Objectives:** Defining the maximum safe time for using temporary clips during aneurysm surgery could help to reduce cerebrovascular events such as ischemia and infarction in these surgeries.

**Background:** Cerebrovascular brain incidents especially brain aneurysm ruptures are a major cause of death and disability. Monitoring Somatosensory Evoked Potential (SSEP) and corresponding can be used for identifying cerebral ischemia and predicting neuronal injuries during temporary clipping in brain aneurysm surgeries.

**Methods:** This clinical trial study was conducted on the patients who were candidate for anterior cerebral circulation aneurysm surgery during 2017-2018 in Rasoul Akram Hospital. SSEP monitoring was performed for the median nerve in the contralateral wrist and posterior tibialis nerve in the contralateral ankle to examine tissue perfusion by Middle Cerebral Artery (MCA) and Anterior Cerebral Artery (ACA) during surgery respectively. Before applying temporary clips, SSEP was recorded as baseline and then every minute until clip removal. Friedman test was applied to explore average latency and amplitude change percentage in the 1st, 2nd, and 3rd minutes after temporary clipping.

**Results:** Totally 9 patients (9 aneurysms) were studied. The aneurysm was located in anterior communicating artery complex and MCA bifurcation in 7 and 2 patients respectively having the size of 5 to 11 millimeters. The average SSEP latency change percentage in the 3rd minute after clipping was significant in respect to baseline; in contrast to changes in the 1st and 2nd minutes ( $P=0.050$ ), but amplitude change percentage had no significant difference ( $P=0.276$ ).



**Conclusions:** Intraoperative neuromonitoring, especially latency changes in SSEP can be used as an index for examining tissue perfusion level of the brain and help to prevent ischemic brain injury during temporary clipping. It seems that 3 minutes after temporary clipping on ACA and MCA, some ischemic stress starts to happen in sensorimotor cortex.

1784

## Spine

ePoster presentation

### Arachnoid cyst after spinal anesthesia for cesarean section: a case report

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**Objectives:** To comprehensively describe the clinical presentation, diagnostic evaluation, treatment interventions, and long-term outcomes of an arachnoid cyst in a patient following spinal anesthesia during a cesarean section, to enhance medical understanding, highlighting potential risks associated with spinal anesthesia, and facilitating improved clinical management of similar cases in the future.

**Background:** Spinal arachnoid cysts (SACs) represent about 1-3% of all primary space-occupying lesions in the spinal column. Although their pathogenesis remains uncertain, secondary SACs can result from various conditions. SACs associated with spinal anesthesia are a relatively rare condition. There are some reported cases in the literature, none from Angola, where spinal anesthesia is frequently used in obstetric procedures. For this reason, we present an interesting case of this condition following spinal anesthesia procedure for a cesarean section.

**Methods:** A 26-year-old woman, positive for HIV, presented after a cesarean section with spinal anesthesia, with severe headaches, progressive lower limb muscle weakness, vesical and rectal sphincter dysfunction, and hypoesthesia. Conservative treatment with physiotherapy was unsuccessful. A spinal MRI revealed an anterior fluid collection suggestive of an arachnoid cyst in the upper thoracic spine with increased spinal cord signal. She underwent laminectomy and adhesiolysis.

**Results:** The patient remained hospitalized for about 15 days after the procedure, without complications during this period. In follow-up appointments, satisfactory progress was observed with partial improvement in sensitivity. However, the motor deficit persisted. Currently, she moves with the assistance of a wheelchair and relies on others to perform daily activities.

**Conclusions:** Despite the low incidence of complications associated with spinal anesthesia, and many of them being reversible, arachnoiditis or arachnoid cysts and other neurological complications resulting from procedures under this type of anesthesia should be considered and thoroughly investigated in cases of suspicion to ensure early interventions and reduce the risk of permanent neurological deficits, as seen in the reported case.



1785

## Spine

ePoster presentation

Simplifying complex spine surgery with 'Anjali technique': a fully manual operative technique for achieving robotic spinal fixation precision

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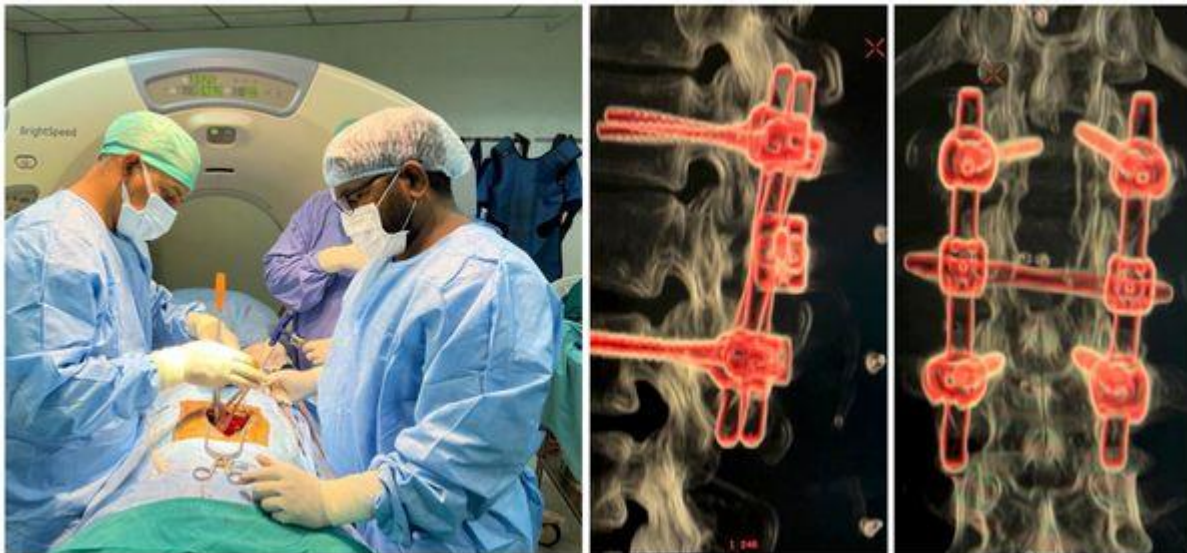
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**Objectives:** To describe an innovative new operative technique developed by the author using 3D-CT guidance to simplify complex spine surgery to achieve the precision of robotic navigation guided spine fixation.

**Background:** Pedicle screw fixation in complex spine surgery using the traditional C-arm guided technique is associated with misplaced screws, even when done by experienced neurosurgeons. Pedicle breach by screws is associated in considerable morbidity and mortality. The risks include dural tear, CSF leak, pseudo-meningocele; neurological injury; paralysis; bowel, bladder or sexual dysfunction; visceral, vascular injury and sudden death. To reduce these risks Robotic spinal navigation guided fixation technique has been adopted recently. However, Robotic spinal fixation machines are extremely expensive and therefore limited to a few elite centres around the world. The vast majority of Neurosurgical centres still use C-arm as the only guidance for complex spine fixation.

**Methods:** The Anjali Spinal Navigation Technique was developed at KVM Hospital through original research and development by Dr Avinash Haridas in 2022. It was the culmination of 10 years of experience in doing 3D CT guided spinal injections. This is an innovative new fully manual operative spinal navigation technique without the use of any traditional neuronavigation machines or traditional C-arm and was the first intra-operative 3D-CT guided spinal fixation in Kerala, India.



**Results:** The Anjali Spinal technique utilises a fully manual navigation technique with the help of K wires and Pedicle pins with 3D Intraoperative CT guidance for achieving accurate pedicle screw placement comparable to Robotic navigation spinal fixation. By avoiding pedicle breach by spinal screws, all the complications associated with traditional C-Arm guided fixation are avoided.

**Conclusions:** The 'Anjali technique' helps the Neurosurgeon to avoid dangerous complications associated with C-arm guided fixation to safely place pedicle screws without recourse to Robotic spine fixation machines.

1787

## Paediatric

ePoster presentation

Clinico-radiological evaluation, demographic pattern and surgical management in patients of occipital encephalocele

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**Objectives:** The aim of this review is to provide a comprehensive overview of the current understanding of occipital encephalocele, including its incidence, signs and symptoms, diagnosis, and treatment. By reviewing the existing literature this paper aims to present a consolidated and up-to-date understanding of this congenital condition.

**Background:** Encephalocele is a birth defect caused by a neural tube defect in which a portion of the brain protrudes through an opening in the skull. Occipital encephalocele is the most common type and typically appears as a midline swelling over the back of the skull. It is important to diagnose and treat this condition as early as possible to prevent complications and improve outcomes. Treatment may involve surgery to repair the opening in the skull and reposition the protruding brain tissue.

**Methods:** This retrospective study included 24 patients admitted with congenital swelling over occipital scalp under department of neurosurgery, GRMC and associated J.A. group of Hospitals from May 2022 to April 2023 who underwent surgery. No randomisation done.

**Results:** The study included 24 patients, with 71% being female and 29% being male. Occipital encephalocele has an incidence rate of 1 in 3000 to 1 in 10,000 live births, and about 90% of cases involve the midline. Magnetic resonance imaging (MRI) is considered the best diagnostic method for occipital encephalocele. Surgical intervention is the preferred treatment option for occipital encephalocele. However, the overall morbidity and mortality rate associated with this condition is still high, despite advanced surgical techniques. Nevertheless, recent advancements in high-resolution imaging, proper surgical management, and post-operative care have significantly improved outcomes.

**Conclusions:** Occipital encephalocele is the most common type of encephalocele. Diagnosis primarily relies on neuroimaging. Surgery is the optimal treatment. Despite high morbidity and mortality rates, advancements in imaging, surgical techniques, and post-operative care have led to significant improvements in recent years.

1788

## Oncology

ePoster presentation

### Role of exoscope in intracranial space occupying lesion surgeries: a prospective study

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**Objectives:** The study was conducted to find the practicality, advantages and disadvantages of exoscope assistance rather than use of conventional microscope in ICSOL surgeries.

**Background:** Exoscopes have emerged as a promising and reliable substitute or supplement to the conventional binocular surgical microscope in procedures such as brain tumour and skull base surgery, aneurysm clipping, as well as complex cervical and lumbar spine surgery. They offer a safe and efficient option, potentially paving the way for a groundbreaking era in the realm of innovative tools and techniques within the field of neurosurgery.

**Methods:** This Prospective study included patients admitted with intracranial space occupying lesions under department of neurosurgery, GRMC and associated J.A. group of Hospitals from April 2023 to May 2023 who underwent surgery. No randomisation done.

**Results:** Out of a total of 9 patients, the male population accounted for 57%, while the female population comprised 43%. More than half of the patients, specifically 66.6%, were aged 40 years or older. The prevailing condition among most patients was glioma with a combination of solid and cystic components. During the utilisation of the exoscope, the overall rate of surgical complications was 11.1%. These complications exhibited a similar profile to those observed in patients who underwent the same procedures with the traditional operating microscope. Moreover, there was an overall incidence rate of 11% for switching from the exoscope to the operating microscope during the course of surgery.

**Conclusions:** The utilisation of the exoscope has consistently yielded positive surgical outcomes, surpassing the results achieved with the operating microscope, particularly in surgeries for intracranial space-occupying lesions (ICSOL). The exoscope has emerged as a secure alternative to the traditional operative microscope for common brain procedures, offering several notable advantages. These include user-friendly simplicity, improved 3D visualisation, and enhanced magnification of the surgical field.

1789

## Spine

ePoster presentation

Large anterior lumbar-sacral meningocele: radiological features, management and outcome

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**Objectives:** The objective of this study was to diagnose individuals exhibiting symptoms related to large anterior lumbar-sacral meningocele and to examine the radiological features, management difficulties and outcomes associated with these tumors.

**Background:** Anterior lumbar- sacral meningocele is an uncommon type of spinal dysraphism, which can occasionally be linked to syndromes like Currarino and Marfan syndromes. While neurological complications are infrequent with these lesions, secondary conditions such as meningitis, sepsis, obstetric issues, and bowel and bladder difficulties are frequently observed. Surgery is the treatment for symptomatic or enlarging masses. Repairing the dural defect can be achieved using either anterior or posterior surgical approaches.

**Methods:** This retrospective study included two patients admitted with radiologically diagnosed anterior lumbar-sacral meningocele under department of neurosurgery , GRMC and associated J.A. group of Hospitals from May 2013 to November 2022 who underwent surgery. No randomisation done.

**Results:** The primary objective in the management of anterior lumbar-sacral meningoceles is the complete cessation of communication between the spinal subarachnoid space and the meningocele. Several reported procedures encompass the posterior approach involving sacral laminectomy and ligation of the neck of the anterior sacral meningocele, the transabdominal approach with meticulous suturing of the neck of the meningocele, the perineal approach, and the utilisation of lumboperitoneal shunt insertion in instances where surgical closure proves ineffective for large fistulas.

**Conclusions:** Patients diagnosed with anterior lumbar-sacral meningocele exhibit favourable prognosis and surgical outcomes. Surgical closure is considered the optimal therapeutic strategy for addressing anterior lumbar-sacral meningoceles, primarily due to their inherent lack of spontaneous regression and inclination towards progressive enlargement, which increases the risk of complications. It is important to acknowledge that surgery for anterior lumbar-sacral meningoceles presents demanding and challenging circumstances. The intricate nature of the procedure, coupled with the rarity of these defects, contributes to the surgical complexities associated with their management.

1790

## Trauma

ePoster presentation

### Head injury in paediatric age group patients: a retrospective study

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**Objectives:** The purpose of this study was to assess the demographic pattern, incidence, clinicoradiological features and prognosis in paediatric population.

**Background:** Pediatric head injuries occurs in approximately 30% of all cases involving head trauma. In children, the mechanisms leading to such injuries are diverse, resulting in prognostic outcomes distinct from those observed in adults. These subgroups display dissimilarities in terms of injury patterns, susceptibility to skull fractures, brain swelling, ischaemic brain damage, and tolerance to hypoxia and blood loss, all of which significantly impact the overall prognosis.

**Methods:** This retrospective study included all 148 paediatric age group patients admitted with head injury under department of neurosurgery, GRMC and associated J.A. group of Hospitals from January 2022 to December 2022 who seek medical or surgical management. No randomisation done.

**Results:** The total number of paediatric patients admitted with head injury were 148 from January 2022 to December 2022. Most of the patients were male (56.7%) children between 6 to 14 years of age with a history of fall from height (43.9%) or road traffic accidents (37.8%). Most of them (68.9%) had a GCS of >13 at the time of presentation. NCCT head was suggestive of linear or depressed fractures in 62.1% patients, rest had single or multiple hemorrhagic contusions, diffuse axonal injury or hematomas. Surgical intervention was performed on 20.9% patients while others were managed conservatively. Mortality was reported in 8.1% cases.

**Conclusions:** The prognosis of paediatric head injuries is closely linked to the Glasgow Coma Scale (GCS) score at the time of therapeutic intervention. Parenchymal injuries, such as contusions, generally have a favourable prognosis and often do not necessitate surgery, responding well to conservative treatment. Intracranial hematomas are infrequent in children, and their prognosis is good. Neuronal plasticity may be a cause of great recovery in children even after having unconsciousness for long duration.

1793

## Education, Ethics, Socioeconomic

ePoster presentation

SimSpine: a cost-effective spinal endoscopy training prototype for neurosurgical residents skills training

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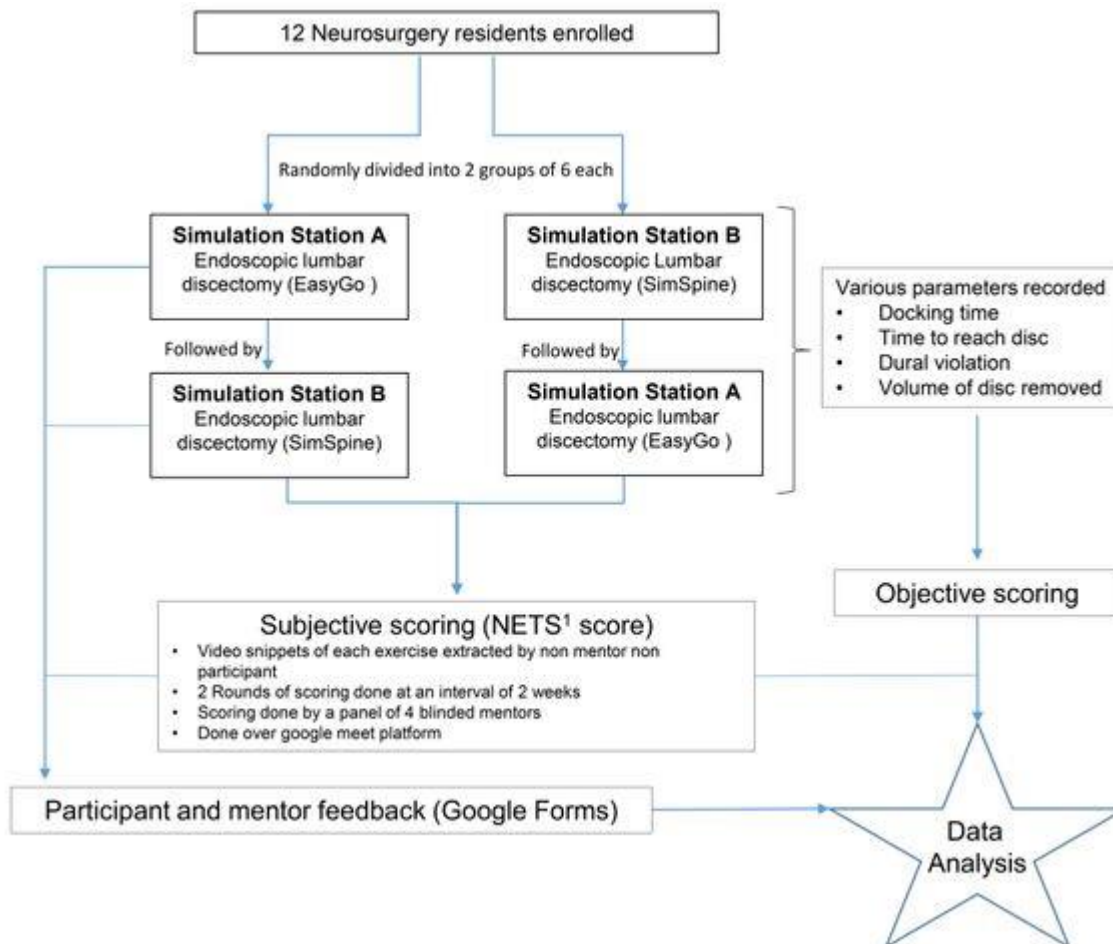
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**Objectives:** To compare the SimSpine (indigenously developed, low-cost model) and EasyGO! (Karl Storz, Tuttlingen, Germany) systems for simulation of endoscopic discectomy.

**Background:** Delving into the significance of simulation-based training, this study sheds light on the author's innovative low-cost simulator and its transformative impact on neurosurgical skill acquisition.

**Methods:**



Twelve neurosurgery residents, 6 in postgraduate years 1-4 or equivalent (junior) and 6 in postgraduate years 5-6 or equivalent (senior), were randomly allocated (1:1) to either EasyGO! or SimSpine endoscopic visualization systems for

endoscopic lumbar discectomy simulation on the same physical simulator. After the first exercise, the participants switched over to the other system, and the exercise was repeated. Time taken to dock the system, time to reach annulus, time required for task completion, dural violation, and volume of disc material removed were used for calculating objective efficiency score. Subjective scoring (Neurosurgery Education and Training School [NETS] criteria) was performed by 4 blinded mentors based on recorded video on 2 separate occasions 2 weeks apart. Cumulative score was calculated based on efficiency and Neurosurgery Education and Training School scores.

**Results:** Performance metrics were similar across the 2 platforms, regardless of participant seniority ( $P > 0.05$ ). Time to reach disc space and discectomy time improved for both EasyGO! ( $P = 0.07$  and  $P = 0.03$ , respectively) and SimSpine ( $P = 0.01$  and  $P = 0.04$ , respectively) between first and second exercises. Efficiency and cumulative scores were better ( $P = 0.04$  and  $P = 0.03$  respectively) when EasyGO! was used as the first device compared with SimSpine.

**Conclusions:** SimSpine is a cost-effective viable alternative to EasyGO for endoscopic lumbar discectomy simulation-based training.



1795

## Spine

ePoster presentation

Gout: a rare cause of lumbar canal stenosis. Cases reports and literature review

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**Objectives:** It was of a sharing surgical experience with Literature review.

**Background:** Chronic gout so called tophaceous gout is the ultimate clinical stage of gout process, characterized by a ubiquitous deposit of urate crystals. The Spinal Gout is rare and almost never suspected in our context. It may occurs as an acute rachialgia and/or a radiculopathy, a slow spinal cord compression mimicking a spondylodiscitis with/without epiduritis.

**Methods:** Two male patients aged of 42 and 60 years old were collected from January til August 2022, all immunocompetent without any medical history of tuberculosis.

**Results:** Gout was unknown in the youngest, but known and poorly followed in the eldest patient. Both cases involved a tight lumbar canal stenosis revealed by progressive paraparesis without sphincter disorders, unbearable positional back pain and inconstant fever. The MRI done was always suggestive of spondylodiscitis. A laminectomy with biopsy was performed on both cases. The tophus was ligamentous in one and spondylo-ligamentous in other case. Motor recovery was progressive from Day-2 to Month-1 postoperative. While waiting histological result a probabilistic antituberculosis treatment was started preoperatively. Hyperuricemia was constant before and after surgery, of 665.8  $\mu\text{mol/l}$  for the youngest and 635.7  $\mu\text{mol/l}$  for the eldest. Histology was of a non-specific inflammatory tissue with negative *Polymerase Chain Reaction to Mycobacterium tuberculosis (PCR-BK)*. Antigout treatment was started after surgery with serious rheumathologic follow-up and antituberculosis treatment was stopped afterwards.

**Conclusions:** Spinal gout should be suggested after 40 years with clinical occurrence of significant inflammatory rachialgia with important neurodeficit and less contributive neuro-imaging.

1797

## Neurovascular Surgery

ePoster presentation

The learning curve for cavernous sinus surgery illustrated by symptomatic intracavernous aneurysm clipping through a pretemporal transcavernous approach

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**Objectives:** To reveal the learning curve for CS surgery via the pretemporal transcavernous approach (PTTC), surgical procedures were examined. The authors proposed 4 levels of surgical difficulty in opening the walls of the CS through this approach.

**Background:** The anatomy of the cavernous sinus (CS) has been well studied in the laboratory for decades; however, performing surgery in and around the CS is still a challenge.

**Methods:** Four levels of surgical difficulty were proposed. Pathologies corresponding to each level of difficulty in and around the CS were categorized in each level together with explanations. All CS cases from 2009 to 2021 were reviewed and categorized to demonstrate the learning curve.

**Results:** Four levels of surgical difficulty are as follows: level 1, a basic Dolenc extradural approach, which involves opening the anterior third of the superior and lateral walls of the CS; level 2, mobilizing the internal carotid artery (ICA) and opening the proximal dural ring to enter the roof of the CS and treat lesions around the clinoid and upper cavernous ICA; level 3, opening the entire aspect of the superior and lateral walls of the CS, which involves opening the oculomotor triangle and peeling the lateral wall of the CS to the tentorial incisura; and level 4, mobilizing cranial nerves III, IV, and V1 to gain access to the supra-/infratrochlear triangles to have proximal ICA control and opening the posterior wall as the last step to enter the posterior fossa.

**Conclusions:** The learning curve for CS surgery is long. The authors use 4 levels of surgical difficulty to describe applications of the PTTC in CS surgery. This approach serves as an effective workhorse in treating CS pathologies with low morbidity and high success rates when performed by experienced neurosurgeons.

1800

## Hydrocephalus

ePoster presentation

Management of post-infectious hydrocephalus in HIV infected adults: a prospective observational study

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**Objectives:** The study aimed to prospectively document long term survival outcomes and neurological function in patients who underwent treatment for post-infectious hydrocephalus with HIV co-infection.

**Background:** Post-infectious hydrocephalus is an important human immunodeficiency virus associated complication presenting to neurosurgeons in South Africa, but there is limited evidence to guide management of these patients.

**Methods:** The study included a consecutive series of 23 HIV positive adults presenting to a tertiary hospital in 2018 with a diagnosis of post infectious hydrocephalus who were followed up for a 12-month period. Baseline demographics, HIV data, and Glasgow Coma Score, aetiology of post infectious hydrocephalus and treatment modality were documented, And outcomes including mortality and neurological function (modified Rankin Scale) assessed. The cohort was divided into non-randomised treatment groups, surgical (ventriculoperitoneal shunts/ external ventricular drain) and medical (lumbar spinal taps) based on institutional practice.

**Results:** PIH aetiologies were noted as tuberculous in 78.1% (n=18) and cryptococcal in 21.7% (n=5). Overall survival at discharge was noted at 69,9% (n=16) following treatment, and 47.8% (n=11) at 12 months follow up. Functional outcomes expressed as mRS, resembled the survival data, showing favourable outcomes within the survival group. Linear regression analysis showed that the cohort had an unchanged mRS during the 12 month period (p=0.008).

**Conclusions:** This data supports active treatment of PIH in virologically suppressed individuals. A tiered treatment algorithm is proposed to guide the treatment of these patients. Further studies using this treatment algorithm could provide a more accurate representation of outcomes in this population.

1804

## Hydrocephalus

ePoster presentation

The leakage and the blockage: how to identify from a shuntogram

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**Objectives:** CSF diversion is a routine procedure performed in patient with hydrocephalus and malfunction is a known complication.

**Background:** Contrast-enhanced shuntography is a safe and reliable clinical method to determine the patency of the CSF diversion catheter such as from ventriculoperitoneal (VP) and ventriculoatrial (VA) shunt.

**Methods:** The first case is a 8-year-old boy with spina bifida and has a right parieto-occipital (PO) VP shunt in situ. He underwent routine MRI brain follow-up and was found to have hydrocephalus (as compared to previous CT brain). The mother denied any changes to his behavior. A shuntogram showed a pericatheter leakage at the neck area with no contrast flow within the ventricle. This is suggestive of both proximal and distal blockage and the child had the VPS replaced. The second case is a 4-year-old girl with dandy walker malformation who had left frontal omaya and right PO VA shunt. She presented with right frontal subgaleal CSF collection at the site of the previous burrhole. The shuntogram showed patency of the proximal catheter but no contrast flow at the distal catheter. The child was subjected to a revision of the distal VA shunt.

**Results:** The 2 cases represent the usefulness of shuntogram in the pediatric population and help to minimize the intraoperative time and tailor the surgery based on the site of blockage.

**Conclusions:** In cases where there is uncertainty about the site of obstruction, a shuntogram when available should be part of a routine investigation.

1805

## Skull Base

ePoster presentation

The outcome of microscopic transsphenoidal surgery in Universiti Sains Malaysia: single surgeon case series

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**Objectives:** We evaluated a single surgeon and institutional series of transseptal microscopic TSS.

**Background:** Transsphenoidal surgery (TSS) is an increasing preferred treatment for sella lesions. In a university teaching hospital, the microscopic TSS was still adopted with ongoing resident teaching.

**Methods:** A retrospective data analysis included 37 patients who underwent microscopic TSS. The demographic characteristics of the patients, intra-operative analyses, morbidity, mortality and visual assessments were included in this analysis.

**Results:** A total of 37 patients (56.9%) were treated with microsurgical TSS between August 2011 and February 2022. All of them had no previous TSS. More than half of patients who underwent microscopic TSS (n = 22; 59.5%) were symptomatic with raised intracranial pressure symptoms. The mean percentage of volume reduction was 79.0% with complete resections identified in 30.6% of the patients. Histopathology studies showed nonfunctioning pituitary adenoma (PA) (56.7%), functioning PA (37.8%), craniopharyngioma (2.7%), and Rathke's cleft cyst (2.7%). Intraoperatively, 9 patients were found to have cerebrospinal fluid (CSF) leak and 7 of them required a lumbar drain. Sinonasal complications include rhinosinusitis and sphenoid polyp in 1 patient, respectively. Endocrinology outcome identified 11 patients (29.7%) to have transient (8 patients; 21.6%) and permanent (3; 8.1%) diabetes insipidus. Central nervous system (CNS) events, including meningitis and seizure were 5.4%, while general complications, such as respiratory events and septicemia were 8.1%. For the visual assessment, 60% (21 patients) reported symptoms as somewhat improved or resolved before discharge, and this improved to 69% at 1 year follow-up.

**Conclusions:** Microscopic TSS remained a promising procedure that allows sufficient visualization of the surgical field and adequate tumor removal. A continuous learning curve is required to gain the expertise.

1806

## Epilepsy

ePoster presentation

The drop attacks, cavum septum pellucidum and polymicrogyria

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**Objectives:** The relationship between the drop attacks, cavum septum pellucidum and polymicrogyria remains difficult to appreciate.

**Background:** A 33-year-old male has a history of epilepsy since 2017. His seizure semiology involved drop attacks which caused him minor head injuries. On different occasions, his semiology involved head turning to the right and tonic movement of the upper limb. If this occurs during walking, the patient will start to deviate to the right side. Postictally, the patient will start fidgeting and use his hands to rearrange the objects in front of him. The frequency was at least 6-8 times per month. MRI brain showed a right frontoparietal polymicrogyria with cavum septum pellucidum (CSP). The video electroencephalogram (EEG) confirmed the epileptogenic zone (EZ) arose from the right frontoparietal area.

**Methods:** Under general anesthesia, the patient was subjected to a right frontal burrhole and endoscopic fenestration of CSP (Figure 1), followed by craniotomy and insertion of Electrocorticography (ECoG) (Figure 2) A comparison between the preoperative ECoG monitoring and day 3 postoperative EEG monitoring confirmed that the spike and wave activity had resolved.. Over 48 hours postop, continuous EEG monitoring was performed confirming the EZ and irritative zone (IZ). Under the awake procedure, the previous craniotomy site was reopened. Using intraoperative ECoG monitoring, a cortisectomy with multiple subpial transection of polymicrogyria was performed.

**Results:** A comparison between the preoperative ECoG monitoring and day 3 postoperative EEG monitoring confirmed that the spike and wave activity had resolved (Figure 3).

**Conclusions:** Eventhough CSP is a normal anatomic variant and mostly an incidental finding, in our case, the cause of the drop attack likely arises from this pathology. Endoscopic fenestration of the cyst is a treatment option that can be performed prior to or during cortisectomy of the polymicrogyria. Continuous ECoG monitoring allows accurate identification of the EZ which adds value during cortisectomy.

1808

## Neurovascular Surgery

ePoster presentation

Carotid endarterectomy for plaques in a high carotid bifurcation: experience of a single center and surgical technical nuances

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**Objectives:** - Describe the surgical technical nuances for adequate exposure in a way to decrease some complications.  
- Report the experience of a single center for carotid artery stenosis in relation to the high carotid bifurcation.

**Background:** CEA, like any surgical intervention, has its risks and complications that are mainly related to the anatomy and the surgical technique used. One of the most concerning situations is when the carotid artery bifurcation is higher than usual.

**Methods:** We reviewed 250 CAE in a period between 2012-2023 performed at Arkansas Neuroscience Institute. The criteria selection was CAE which involves carotid artery bifurcation level  $\geq$  C3 cervical spine level. Pre and postoperative clinical data were assessed using a modified Rankin scale (mRS) with a period follow-up > 1 month.

**Results:** We found 60 patients with carotid stenosis in a high carotid bifurcation. Some of the surgical nuances performed were extending the incision superiorly in a curved fashion, using the surgical loops to mobilize the XII cranial nerve, retracting the digastric muscle along other soft tissues, and pulling and elevating the carotid branches for better exposure. In some other cases, the application of Yasargil clips over the distal ICA was preferred and the Superior Thyroid Artery was mobilized using silk sutures. Recognizing the major anatomical structures (XII, ansa cervicalis, XI, facial marginal branch, greater auricular nerve, anterior auricular, branches of the ECA) and how to handle them was an important factor in having no postoperative complications.

**Conclusions:** Know the adequate knowledge of the anatomical structures and proper surgical technique in a way to turn HCB surgery into an LCB surgery. In this manner, the neurosurgeon is going to be more familiar with the technique of how to expose and avoid some common complications located in this region.

1810

## Oncology

ePoster presentation

### The role for surgical interventions in the treatment of CNS lymphomas

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**Objectives:** To assess the effect of surgical resection over biopsy on the overall survival of patients with primary CNS lymphoma.

**Background:** Primary central nervous system lymphomas (PCNSL) are rare extranodal lymphomas accounting for less than 1% of all non-Hodgkin lymphomas. Diagnosis is most often suspected on MRI and confirmed by histopathology. The role for the neurosurgeon is limited to sampling only, but in selected cases surgical resection is performed.

**Methods:** Data from PCNSL patients treated in our institutes in Budapest, Hungary between 2012 and 2022 were retrospectively collected. 146 patients were included. Survival data were collected. Kaplan-Meier curves were statistically analysed.

**Results:** The median age of all patients was 66.08 years (biopsy group: 65.8 years, resection group: 66.3 years). 105 patients had stereotactic biopsy and 41 had surgical intervention. Overall survival (OS) was found very dismal in both groups. OS was significantly worse in the higher IESLG score groups, and among patients above 60 years. After subgrouping patients according to age (under and above 60 years) we found a tendency of better OS in younger patients undergoing surgery, but the difference is not significant. The effect of age is significant in the surgery group, but not in the biopsy group. Also, older patients had significantly poorer OS in the surgery group.

**Conclusions:** Although the PCNSL is a rare entity, we could analyze relatively high number of cases. The complete resection of the tumor mass did not seem to improve OS in PCNSL. Moreover, in older patients open surgery is not recommended not even in operable cases.



1813

## Global Neurosurgery

ePoster presentation

Development of a novel low-cost exoscope to expand access to microneurosurgical care in low- and middle-income countries

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**Objectives:** To present an affordable and simplified exoscopic viewing system for low-resource settings. It represents an alternative within the systems used in microneurosurgery.

**Background:** Less than a quarter of the world population has access to microneurosurgical care within a range of 2 hours. We introduce a simplified exoscope system to achieve magnification, illumination, and video recording in low-resource settings.

**Methods:** We combined an industrial microscope tube a heavy-duty support arm, a wide-field c-mount digital microscope camera, and a light-emitting diode ring light. All parts were sterilized with ethylene oxide. we performed 13 spinal and 3 cranial surgeries with the help of the low-budget exoscope.

**Results:** The average preoperative setup time was 12.8 minutes. The exoscope provided similar magnification and illumination like a conventional binocular microscope. It allowed operating in a comfortable posture. The field of vision ranged from 30 mm to 60 mm. The surgical field was captured by a 16-megapixel two-dimensional camera and projected on a 55-inch high definition television screen in real time. Image quality was similar to that of a conventional microscope although our exoscope lacked stereoscopic view. Adjusting camera position and angle was time-consuming. Thus, the benefit of the exoscope was most notable in spine surgeries where the camera remained static for most of the time. The total cost of the exoscope was approximately U.S. \$ 750.

**Conclusions:** Our low-budget exoscope offers similar image quality, magnification, and illumination like a conventional binocular microscope. It may thus help expand access to neurosurgical care worldwide. Users may face difficulty adapting to the lack of depth perception in the beginning. Prospective studies are needed to assess its usability and effectiveness compared to the microscope.

1814

## Trauma

ePoster presentation

A comparative study of complications and outcome between use of subdural drains and subgaleal drains in chronic subdural hematoma surgery

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**Objectives:** This study compared the rate of complications including recurrence, and the Glasgow Outcome Score of patients with subgaleal vacuum drains (SGVDs) with those of SDDs at two months post-surgery.

**Background:** Chronic subdural hematoma (CSDH) is a frequent neurosurgical condition. Burr hole evacuation with post-operative drainage is the best favored surgical strategy. However, whether the post-operative drain location (subdural drain [SDD] versus sub-galeal), influences patient outcomes and complications need to be established.

**Methods:** A double-blinded randomized clinical trial, done in Memfys Hospital Enugu, Nigeria. Consenting adult patients, who met the inclusion criteria, were randomized into two groups: sSDD versus SGVD. Primary endpoint was recurrence requiring re-operation. Secondary endpoints were Glasgow Outcome Score (GOS), parenchymal injuries, residual hematoma width, seizures, and infections. A double-blinded randomized clinical trial, carried out in Memfys Hospital Enugu, Nigeria. Consenting adult patients, who met the inclusion criteria, were randomized into two groups: subdural drainage versus subgaleal drainage. Primary endpoint was recurrence requiring re-operation. Secondary endpoints were Glasgow Outcome Score (GOS), parenchymal injuries, residual hematoma width, seizures, and infections.

**Results:** Sixty-eight patients were included in the analysis: 34 were stratified into SGVD cohort and 34 into SDD cohort. There was no statistically significant differences in recurrence requiring re-operation (SGVD group (5.9%) vs SDD group (8.8%) 95% CI, 0.23 – 9.94, p value of 0.425), and in outcome measures (GOS at two months post-surgery, p value 0.098). between the two cohorts. There was also no significant difference in the rate of intra-parenchymal injury (SGVD 0 versus 3 for the SDD arm, p value 0.238), in the mean width of postoperative residual hematoma, (95% CI, 0.58 – 1.07, p value 0.124), as well as other complications (seizure, SSI et cetera).

**Conclusions:** This study showed no significant difference in the complications and outcome of SDD and SGVD in the management of CSDHs. Both are safe and effective.

1815

## Endovascular Neurosurgery

ePoster presentation

Evaluation of the effect of aneurysmal subarachnoid hemorrhage (aSAH) treatment methods on the level of selected plasma oxidative stress parameters

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**Objectives:** Evaluation of the impact of the aSAH treatment method (clipping vs. coiling) on the level of nitric oxide metabolites (NxOx) in the blood in the early phase of the disease (4<sup>th</sup> day from the onset) and the effect of NxOx level on outcome.

**Background:** aSAH is critical clinical and social problem due to high mortality and disability. The study evaluates impact of treatment method on NxOx level and prognosis. This parameter affects the development of cerebral vasospasm (CV) during the course of the disease which results in delayed cerebral ischemia (DCI) and worsening of the outcome.

**Methods:** This study was performed on 90 aSAH patients. Blood samples were taken immediately on hospital admission and on day 4 of hospitalization. The control group consisted of patients treated for unruptured cerebral artery aneurysm (30 patients). Biochemical results were subjected to a statistical analysis with significance level of  $p=0.05$ . The assessment of the patient's condition on admission was made according to the WFNS scale and on discharge according to the Glasgow Outcome Scale.

**Results:** Clipping leads to greater increase in NxOx levels on the fourth day of onset compared to coiling measured on the fourth day of onset ( $p<0.05$ ).

There is a positive correlation between NxOx level on day 4 from onset and the patient's functional status (GOS) at discharge ( $r=0.44$ ,  $p<0.05$ ).

There is a negative correlation between NxOx level on admission and the patient's condition (WFNS scale) ( $r=-0.3$ ,  $p<0.05$ ).

There is no correlation between NxOx level on admission and the extent of haemorrhage in Fisher-scale CT study ( $r=0.1$ ,  $p>0.05$ ).

**Conclusions:** Clipping leads to greater increase in NxOx level in the early stage (4<sup>th</sup> day from the onset) compared to coiling. This may result in reduce the risk of developing vasospasm in patients treated with this method and improve outcome.

1816

## Education, Ethics, Socioeconomic

ePoster presentation

Basal ganglia hemorrhage: why we do not follow the guideline

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**Objectives:** The most common sites of ICH are supratentorial and hypertension is the most common cause. The decision to treat is important. In the era of randomized trials, the decision for surgery is based on clinical and radiological factors. STICH study concluded that early surgery or initial conservative treatment do not differ significantly. STICHII further shows that surgery will reduce the mortality rate from 24% to 18% at 6 months, as compared to conservative treatment. At our center, surgical treatments are still being performed despite knowing that patients will have poor outcomes.

**Background:** Cerebrovascular disease is the 3rd most common cause of death in Malaysia. It is the second leading cause of death after ischaemic heart disease and the third leading cause of disability-adjusted life-years (DALYs) lost worldwide.

**Methods:** We presented 4 cases of patients who came with spontaneous basal ganglia hemorrhage secondary to hypertensive vasculopathy. Patients were in their 50-60 years of age and were fully independent before the event. The poor presentation (all came with GCS 7-9/15) location of the hematoma certainly do not fit into the trial criteria. However, we elected for surgical treatment after careful discussion with family member.

**Results:** All cases presented came with an ICH score of 3, suggestive severity of the disease. Furthermore, we believe that in many countries the patient will be treated conservatively considering poor Modified Rankin Scale (mRS) (in our cases, mRS 5). In our community, careful counseling was given to the patient's family members that the outcome is poor and the patient will end up fully dependent.

**Conclusions:** Our community seems to accept and be willing to look after the patient after discharge home. The sense of keeping the patient alive and continuing to take care of the patient despite being fully dependent is a wish that should be respected by the physicians.

1818

## Neurovascular Surgery

Oral presentation

Sonolysis in prevention of brain infarctions during internal carotid endarterectomy (SONOBIRDIE). The results of randomized controlled trial

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**Objectives:** Minimizing perioperative vascular complications after carotid endarterectomy (CEA) is essential for its safety.

**Background:** Sonolysis/sonothrombolysis is a novel treatment method tested for acceleration of recanalization of acute arterial occlusion in acute stroke patients and patients during interventions with high risk of stroke including CEA.

**Methods:** We conducted a multicenter, phase 3, double-blind, controlled trial in which patients undergoing CEA were randomly assigned in a 1:1 ratio to receive sonolysis or shame procedure. The primary endpoint was the incidence of composite of perioperative stroke, transient ischemic attack and death. There were occurrence of death, any stroke, or myocardial infarction within 30 days and 1 year key secondary endpoints, incidence of new ischemic lesions on follow-up brain magnetic resonance imaging (MRI) main substudy endpoint and incidence of intracranial bleeding and any adverse event main safety endpoints.

**Results:** A total of 1004 patients out of 1492 planned number were enrolled until interim analysis, 507 were assigned to sonolysis and 497 to control group. The mean age of the patients was 68 years, and 31.1% were women. The results for the primary endpoint favored the sonolysis group (risk difference, -5.5%; 95% confidence interval [CI], -8.3 to -2.8%;  $P < 0.001$ ) as in the substudy for new ischemic lesions on follow-up brain MRI (risk difference -8.9%; 95%CI, -15 to -2.8%;  $P = 0.004$ ). Sensitivity analysis calculated risk ratio for sonolysis of 0.28 (95%CI, 0.15 to 0.54) for primary endpoint, 0.25 (95%CI, 0.11 to 0.56) for stroke and 0.23 (95%CI, 0.07 to 0.73) for TIA within 30 days. The incidence of death within 30 days and 1 year did not differ between the groups. Sonolysis was found to be safe; 94.4% of the patients who underwent CEA with sonolysis were free from major adverse events at 30 days.

**Conclusions:** In patients undergoing carotid endarterectomy, sonolysis was safe and resulted in significant reduction of perioperative stroke, TIA and composite of perioperative stroke, TIA and death within 30 days. (Funded by Czech health research council; SONOBIRDIE ClinicalTrials.gov number, NCT03904147.)

1819

## Spine

ePoster presentation

### Personalized 3D-printed implant for thoracic vertebra body replacement after en bloc resection of a tumor with two-year follow up period

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**Objectives:** This study aims to evaluate the application of 3D-printed individual vertebral prostheses for reconstructing the spine following thoracolumbar Total En-bloc Spondylectomy (TES) in patients with benign spinal tumors. The primary objectives include assessing the feasibility of 3D-printed prostheses in various reconstruction scenarios and determining their impact on spinal stability and neurological function in the short term.

**Background:** The lack of specialized implants for reconstruction after tumor resection is one of the urgent problems in modern oncology, and the use of implants based on 3D printing is in demand.

**Methods:** A retrospective analysis was conducted on four patients who underwent TES between 2019 and 2020. Patient data, including demographics, tumor characteristics, and surgical details, were collected. Customized 3D-printed vertebral prostheses were created based on computed tomography (CT) and magnetic resonance imaging (MRI) scans. Surgical procedures were performed, and clinical outcomes were assessed using the Visual Analog Scale (VAS) for pain and the Oswestry Disability Index (ODI) for functional status. Mechanical strength testing of the implants was conducted, and statistical analysis was performed using ANOVA.

**Results:** Preliminary results indicate that 3D-printed individual vertebral prostheses are suitable for anterior column reconstruction following TES. VAS and ODI scores showed significant improvements post-surgery, reflecting reduced pain and enhanced functional outcomes. Mechanical testing revealed the implants' robustness, with no signs of deformation or failure even at maximum loads.

**Conclusions:** The integration of 3D printing technology into spinal surgery holds promise for optimizing patient-specific reconstructions. Customized vertebral prostheses offer benefits such as improved surgical planning, reduced procedure duration, and minimized perioperative blood loss. While challenges, including the need for specialized software and limited long-term data, exist, this study underscores the potential of 3D-printed implants in enhancing patient outcomes. Further research with a larger patient cohort and longer follow-up periods is essential to confirm the effectiveness of personalized implants in spinal surgery.

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