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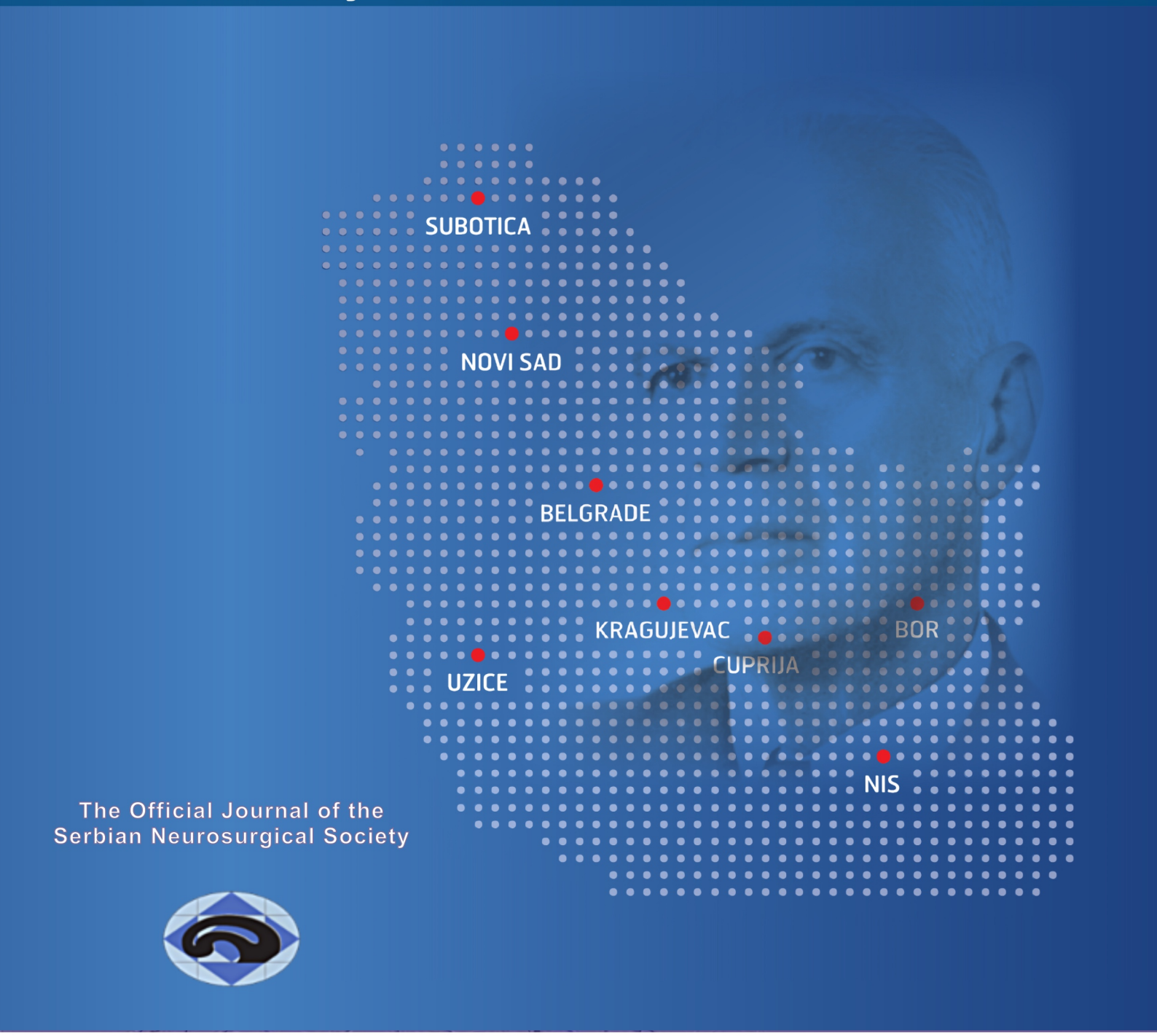

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ABSTRACTS FROM

100 years of neurosurgery in Serbia: Focus. Dedication. Specialization.

9th Annual meeting & 10th Congress of the Serbian Neurosurgical Society with international participation

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ABSTRACTS FROM THE 9TH ANNUAL MEETING & 10TH CONGRESS OF THE SERBIAN NEUROSURGICAL SOCIETY WITH INTERNATIONAL PARTICIPATION: 100 YEARS OF NEUROSURGERY IN SERBIA: FOCUS. DEDICATION. SPECIALIZATION.

001 ORGANIZATIONAL PROTOCOLS AND PRINCIPLES OF TREATMENT OF TRAUAMTIC BRAIN AND SPINE LESIONS IN UNIVERSITY CLINICAL CENTRE OF VOJVODINA

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Treatment of head injuries dates back to ancient times. Today, we are witnessing the existence of a large number of modern protocols in the treatment of traumatic brain injury (TBI), which are updated and periodically revised. Modern protocols strictly adhere to the division into mild, moderate and severe TBI. Since TBI is one of the main causes of death and permanent disability of the young and working population, more attention is paid to improving the treatment of the injured.

TBI occurs due to the effect of external mechanical force on the cranium and endocranial contents, which results in temporary or permanent neurological damage, functional disability or psychosocial maladjustment. The estimated incidence in Serbia is 700-800 TBI per 100, 000 inhabitants per year. TBI represents a major health, socioeconomic and forensic problem that is evident in all countries with a developed health system. Since 1974, the Glasgow Coma Scale (GCS 3-15) has been used to assess the severity of TBI. Early endotracheal intubation in severe as well as prevention of secondary brain damage by combating hypoxemia and arterial hypotension in severe and moderate TBI, are just some of the measures.

In the structure of hospitalized patients at the University Clinical Center of Vojvodina (UKCV) Neurosurgery Clinic in the last 5 years, as many as 40% belong to head trauma, which is in the first place. 12% of hospitalized patients per year were operated on for acute TBI, which is the third place after operations on the lumbar spine and intracranial tumors. Treatment of injured with TBI is operative in 30% of cases.

The trend of the number of patients operated on for TBI in the last 5 years shows a slight decrease. This was influenced by the application of stricter measures regulated by the traffic law, as well as the change in behavior and reduced movement of individuals during the COVID-19 pandemic.

In addition to UKCV, which as a tertiary health institution provides definitive care for the largest number of injured with TBI, a total of 7 health centers in Vojvodina participate in initial care. Although cooperation with regional hospitals is traditionally very good, we should always strive to improve that cooperation while respecting the aforementioned protocols, all with the aim of even better treatment of the injured.

Keywords: Traumatic brain injury; TBI; Clinical centre of Vojvodina

002 NEUROSURGICAL TREATMENT OF CRANIOPHARYNGIOMAS

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Introduction: The optimal treatment strategy in craniopharyngiomas is still a topic of debate: conservative symptomatic treatment versus extended surgery. However, today it is now possible to achieve complete tumor resection with acceptable morbidity in approximately 80-90% of the patients. This success is attributed to a personal learning curve developed over the past 3 decades.

Patients and Methods: The author's operative series of craniopharyngiomas includes over 400 patients, a third of them children. Open surgery was only performed, if there was no and /or no reversible hypothalamic damage, otherwise symptomatic surgery was indicated.

The transsphenoidal approach was mainly used for tumors with intra- and suprasellar, mainly subdiafragmatic extension, according for up to 40% of cases.

Among various transcranial approaches the frontolateral one has become the dominant method. The pituitary stalk as origin of the tumor defines its midline location and requires efforts to be preserved, even in part if possible.

In the last 25 years the use of navigation and intraoperative MRI, as well as -pure and assisted- endoscopic techniques, have also improved surgical outcome.

Results: There were no case of operative related mortality in the late series.However the rate of surgical complications was about 10%.It is worth noting that in the literature mortality rates tend to be higher while resection rates are lower.

In general endocrinological deficits, particulary diabetes insipidus tend to increase postoperatively, especially in the transcranial series. Improvements- as in case of pituitary adenomas- are exceptional.

As a result of more radical resections in the late series, followed by consequently lower true recurrence rates, the endocrinological deficits increased mildly. The midline location of the tumor originating from the pituitary stalk, in the center of hypothalamo- pituitary regulation necessitates efforts to preserve it, even partially if possible.

Over the years approximately 20% of the patients required radiotherapy to prevent further growth of residual tumor or in case of inoperable true recurrences.

Outlook: The implementation of newly developing hypothalamic sparing operative strategies, including differentiated indication and adequate surgical techniques, as well as novel medical therapy of hypothalamic deficits(e.g. obesity) and molecular diagnosis depending antiproliferative treatment* will improve the results for both the rare papillary and the more frequent craniopharyngioma.

003 ANATOMY AND SURGERY OF MESENCEPHALIC BRAINSTEM TUMORS: PITFALLS AND AVOIDANCE

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The anatomy of the brainstem is one of the most challenging of the Central Nervous System. The mesencephalic area can harbor different tumors, among them cavernomas, a benign and curable disease. Anatomy plays a very important role to avoid postoperative morbidity. The surgical approach must be tailored for every case, trying to incorporate the anatomical concept of “safe entry zone”. Skull base osteotomies to improve the access may be needed for antero- lateral (peduncular) tumors. In this presentation we deal with the anterior, posterior and lateral approaches to mesencephalic brainstem tumors. The subtemporal approach or a cranio- zygomatic approach can lead to the antero-lateral aspects. The mesencephalic median sulcus, the safe entry zone of the lateral mesencephalon, can be reached through parmedian supracerebellar infratentorial approaches. The dorsal mesencephalon can be reached through a transtentorial- suboccipital. Timing is another aspect to be taking into account, trying to avoid early (riskier due to the situation of the patient / higher probability of subtotal removal) and delayed surgery (risk of gliotic tissue around the tumor with increased neurological postoperative morbidity).

The surgery of brainstem tumors must be done in the context of a perfect knowledge of the anatomical neurovascular structures. Timing for surgery is also crucial. Some skull base approaches can be helpful to enter the safe entry zones, along with intraoperative neurophysiological monitoring.

004 MICROSURGICAL AND ENDOVASCULAR TREATMENT OF CEREBRAL ANEURYSMS

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Introductions: Nontraumatic subarahnoid hemorrhage (SAH) of aneurysmal etiology is a neurosurgical emergency. Aneurysm rupture accounts for 80% of nontraumatic SAH and has a high rate of complications and death. Microsurgical clipping and endovascular coiling embolization of the aneurysm is are basic methods for aneurysm exclusion. The objective of this study is to present a comparative study of these basic methods of treatment of cerebral aneurysms performed in Institute of Neurology and Neurosurgery, Chisinau, Moldova.

Methods: The study represents a comparative series of patients who underwent microsurgical clipping and aneurysm coiling for the treatment of SAH. Before intervention, the patients were assessed based on mFisher, Hunt-Hess and WFNS scales. Both procedures were performed under general anesthesia. Outcome criteria were assessed at 3 and 6 months.

Results: All the patients were initially evaluated with an angiographic study (CT angio or angiography) for planning the intervention. The patients were operated under general anesthesia. Direct clipping, clip-reconstruction and coiling and baloon-assisted coiling were procedures used in the majority of cases. Some particular cases were complicated by intraprocedural rupture of the aneurysms, aggressive cerebral vasospasm and bad outcome. All other cases were successfully and the patients were discharged in a mRS score below 3. There was minimal difference in outcome between groups.

Conclusions: Considering effectiveness surgical clipping and endovascular coiling of a brain aneurysm for a patient with SAH, we conclude that further implementation and improvement of these techniques will improve the quality of patient care and improve clinical results.

Keywords: cerebral aneurysm; clipping; coiling; sah

005 CEREBROVASCULAR EXCELLENCE: A PRAGMATIC FRAMEWORK FOR OPTIMAL WORKFLOW AND SUPERIOR OUTCOMES

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Cerebrovascular diseases pose a formidable healthcare challenge, demanding precise and efficient neurosurgical interventions for optimal patient care. This abstract introduces a comprehensive framework tailored to enhance workflow and yield exceptional outcomes in cerebrovascular disease management at the University Clinical Centre of Vojvodina, Clinic of Neurosurgery in Serbia.

Our framework encompasses the following key components:

1. Multidisciplinary Synergy: Successful cerebrovascular disease management hinges on a unified team comprising neurosurgeons, interventional radiologists, neurologists, anaesthesiologists, and allied healthcare professionals. Collaborative synergy underscores a holistic patient-centric approach, effectively minimizing communication barriers.

2. Cutting-Edge Imaging and Diagnostics: We harness state-of-the-art imaging technologies, including magnetic resonance imaging (MRI), computed tomography angiography (CTA), and digital subtraction angiography (DSA), for precise diagnosis and surgical planning. Seamless integration of these tools into our workflow expedites decision-making and optimizes patient-tailored treatment strategies.

3. Tailored Patient Care: The core of our framework emphasizes evidence-based guidelines, patient preferences, and clinical expertise to craft personalized treatment plans, recognizing the uniqueness of each patient's needs.

4. Innovative Treatment Techniques: Remaining at the vanguard of neurosurgical innovation is paramount. Our framework encourages the adoption of cutting-edge surgical techniques and technologies, such as endovascular procedures, minimally invasive approaches, and utilization of 3D printing for surgical models.

5. Continuous Quality Enhancement: Integral to our approach is robust data collection and analysis. Routine evaluation of surgical outcomes, complications, and patient satisfaction informs our ongoing quality enhancement initiatives, ensuring adaptability and responsiveness. 6. Education and Training: We firmly commit to the ongoing education and training of our entire healthcare team. Our framework champions continuous learning, skills refinement, and knowledge dissemination, fortifying the expertise of all stakeholders.

7. Patient-Centered Approach: Our unwavering focus is on the well-being of our patients. The framework promotes patient-centric care, actively engaging them in decision-making, offering emotional support, and ensuring transparent communication throughout their therapeutic journey. In summary, our framework offers a structured and pragmatic approach to cerebrovascular disease management, tailored specifically for the University Clinical Centre of Vojvodina, Clinic of Neurosurgery. Through the cultivation of interdisciplinary collaboration, embracement of innovation, and prioritization of patient-centered care, our neurosurgical team is poised to address the intricate challenges posed by cerebrovascular diseases. This presentation will delve into the intricate details of our framework and share real-world success stories, underscoring its tangible impact in the realm of neurosurgery within our institution.

006 TRANSVENTRICULAR APPROACH TO CAVERNOUS MALFORMATIONS OF THE BRAIN STEM

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The anatomy of the brainstem is one of the most challenging of the Central Nervous System. The brainstem can harbor different tumors, among them cavernomatous lesions. The surgical approach and indication must be tailored case by case. The ventricular anatomy is sometimes the suitable route to remove brainstem cavernomas. Tumors at the pontine region can be approach through the floor of the IV Ventricle: median sulcus and pericollicular area (supra-infrafacial triangle). The cerebral peduncles can be reached sometimes through the fourth ventricle and through a supratonsilar route or retrosigmoid craniotomy. The approach through the IV ventricle sometimes has alternative routes at the ventral pons according to the size of the tumor, as can be reached through a retrosigmoid, presigmoid or transpetrosal approach (safe entry zone: the peritrigeminal-anterolaterally placed-area). There is also another entrance between the exit of V and VII nerves. Tumors at the posterior and superior medullary region can be entered through the posterior median sulcus at the inferior IV ventricle area. Important aspects are: cranial access, transvermian versus telo-velar approach, entrance through the IV ventricle and careful dissection of the plane around cavernoma. Regarding IV ventricle approaches the surgical route includes a suboccipital craniotomy. The traditional midline vermiotomy has been substituted by the telo-velar approach diminishing so the risk of cerebellar mutism among others. The mapping of the fourth ventricle Intraoperative neurophysiological techniques (EMG for cranial nerves, somatosensory and motor evoked potentials for long pathways) are of paramount importance. The mapping of the fourth ventricle is added to the aforementioned technique in order to make the appropriate entrance through the IV ventricle.

The IV ventricle is a suitable surgical route for the resection of certain brainstem cavernomas of the pontine and upper medulla. Alternative routes can be considered in lesions at the pons when abutting the surface of the brainstem.

007 MANAGEMENT OF MENINGIOMAS OF THE LATERAL VENTRICLE

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In this paper, we are presenting the surgical management of primary CNS-tumors located in the lateral ventricles of the brain. We start with a brief overview of the spectrum of individual pathologies and clinical signs and symptoms and touch upon possible imaging-based classifications.

After a short recap of the gross anatomy of the ventricles and adjacent structures, we take the most frequent tumor of the lateral ventricle, choroid plexus meningioma, as a suitable example to discuss key surgical approaches to the atrium and we discuss pros and cons as well as associated complication rates of each approach.

Based on our experience we recommend pursuing a transsulcal corridor via a superior parietal lobule access for lesions located on the right side, and a parasagittal occipito-parietal access for tumors located on the left side. Lastly, we go over the radiosurgical management of this tumor type in patients who cannot undergo microsurgery.

Keywords: Meningioma, ventricle, microsurgery, radiosurgery

008 RECOVERY OF CRANIAL NERVE NEUROPATHIES AFTER LINAC-BASED STEREOTACTIC RADIOSURGERY FOR BENIGN CAVERNOUS SINUS MENINGIOMA

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Objective: Cranial Nerve Neuropathies (CNNs) frequently manifest in Cavernous Sinus Meningioma (CSM). Stereotactic radiosurgery (SRS) or fractionated stereotactic radiosurgery (FSR) are well-established upfront treatments for CSM. This study aims to assess the rates of recovery, time-to-improvement, and recovery patterns of CNNs in patients with CSM who have undergone SRS or FSR. The reported outcomes were analyzed to gain insight into the efficacy of these treatment modalities.

Methods: A retrospective study was conducted on patients with CSM treated with LINAC-based SRS/FSR between the years 2005-2020 at a single institution. A total of 128 treated patients were treated during this period, with 46 patients presenting with CNNs. The study collected and analyzed patient demographics, clinical parameters, SRS/FSR treatment characteristics, post-treatment CNNs recovery duration, status, and radiological control on the last follow-up magnetic resonance imaging (MRI) scan.

Results: The median follow-up duration was 53.4 (range, 3.9-190.4) months. The mean age at diagnosis was 51.8 (range, 19.1-75.7) years. SRS was performed on 25 patients and FSR was performed on 21 patients. The mean pretreatment tumor volume was 9.5 cc while the mean end- of-follow-up tumor volume was 5.1 cc. The mean marginal dose was 12.8 and 48.7 Gy for SRS and FSR, respectively. CNNs recovery was documented in 80.4% of the patients with extra- ocular CNNs showing improvement in 43.2% of the patients, trigeminal CNNs in 32.4%, and optic CNNs in 10.8%. The median time-to-improvement was 3.67 months, with FSR showing a longer time-to-improvement (12.9 months) compared to SRS (2.5 months, p=0.04). The radiological tumor control rate was 100%.

Conclusions: This study suggests that SRS/FSR for CSM provides good and sustainable CNNs recovery outcomes with excellent long-term radiological control. A higher CNNs recovery rate was associated with a smaller pre-treatment tumor volume, while shorter time-to-improvement was identified in patients treated with SRS compared to FSR, particularly in those with small pre-treatment tumor volume.

Keywords: Radiosurgery; cavernous sinus meningioma; cranial nerve recovery;

009 METABOLIC MRI FOR PRECISION MEDICINE

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Modern neurocritical care relies on ancillary diagnostic testing in the form of multimodal monitoring to address acute changes in the neurological homeostasis. Much of our armamentarium rests upon physiological and biochemical surrogates of organ or regional level metabolic activity, of which a great deal is invested at the metabolic–hemodynamic–hydrodynamic interface to rectify the traditional intermediaries of glucose consumption. Despite best efforts to detect cellular neuroenergetics, current modalities cannot appreciate the intricate coupling between astrocytes and neurons. Invasive monitoring is not without surgical complication, and noninvasive strategies do not provide an adequate spatial or temporal resolution. Without knowledge of the brain's versatile behavior in specific metabolic states (glycolytic vs oxidative), clinical practice would lag behind laboratory empiricism. Noninvasive metabolic imaging represents a new hope in delineating cellular, nigh molecular level energy exchange to guide targeted management in a diverse array of neuropathology.

Keywords: MRI; Metabolic, CMRO2

010 THE ROLE OF NEURONAVIGATION AND INTRAOPERATIVE ULTRASOUND IN EXCISION OF BRAIN LESIONS

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Background: The application of imaging during surgery can improve patient outcomes by accurate and thorough removal of lesions while having minimal impact on healthy tissue.

Aim of the Work: to compare the use of neuronavigation to intraoperative ultrasound guidance in excision of intra-axial brain lesion.

Patients and Methods: This cohort study was conducted on 51 patients with intra-axial brain lesion is amenable to gross total resection. The primary outcome was extent of resection assessed using a non-volumetric technique. Other outcomes included the postoperative functional status and the rate of operative complications.

Results: There were 34 patients in the Neuronavigation group and 17 patients in the ultrasound group. The extent of resection was significantly better in the ultrasound group as the extent of tumor resection based on the GTR/NTR/STR method of assessment showed that the IOUS group had statistically significant higher chance of achieving GTR (29.4%) than the navigation group (8.8%). In the IOUS group near total and subtotal resection rates were 17% and 52% respectively. In neuronavigation group 11.8% and 79.4%.

Conclusion: application of ultrasound integrated in Neuronavigation system guidance in surgery excision of intra-axial brain lesions is a useful tool in achieving a higher extent of tumor resection (EOR).

Keywords: Neuronavigation; intraoperative ultrasound; intra axial brain lesions;extent of tumor resection;

011 STATE-OF-THE-ART DEEP BRAIN STIMULATION FOR MOVEMENT DISORDERS

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Deep Brain Stimulation (DBS) is a revolutionary neurosurgical technique that has significantly impacted the treatment of various neurological and psychiatric disorders. Over the last 20 years, continuous advancements have been made to improve the efficacy and safety of this therapy, making it a state- of- the- art intervention in modern medicine. Originally approved for Parkinson's disease, DBS has expanded its applications to treat essential tremor, dystonia, epilepsy, and certain psychiatric conditions such as obsessive-compulsive disorder and major depression refractory to other treatments.

The most prominent advancement in DBS is the development of closed-loop systems. Unlike traditional open-loop systems that deliver constant stimulation, closed-loop systems monitor the brain's activity in real-time and adjust the stimulation parameters accordingly. This innovation leads to more targeted and adaptive therapy, reducing side effects and optimizing treatment outcomes.

Additionally, improvements in electrode technology have led to more precise targeting and better patient outcomes. Advanced imaging techniques, such as functional MRI and diffusion tensor imaging, enable surgeons to precisely locate the target brain areas, ensuring accurate electrode placement. Moreover, novel materials and designs for electrodes have been developed to enhance biocompatibility, longevity, and reduce the risk of complications.

Furthermore, the incorporation of machine learning and artificial intelligence (AI) algorithms has transformed DBS therapy. AI can analyze vast amounts of patient data and optimize stimulation settings automatically. This data-driven approach allows for personalized and patient-specific treatment plans, maximizing the therapeutic benefits of DBS.

The miniaturization of devices is another exciting advancement in DBS. Smaller neurostimulators, rechargeable batteries, and wireless technologies have reduced the surgical invasiveness and enhanced patient comfort. As a result, the procedure's safety profile has significantly improved, making it a more viable option for a broader range of patients.

Looking ahead, ongoing research is exploring alternative stimulation targets and novel waveforms to further refine the therapy's effects and minimize side effects.

In conclusion, state-of-the-art deep brain stimulation has evolved significantly, capitalizing on advanced technologies and scientific insights. The continuous refinement of DBS procedures and devices is driving progress in treating neurological and psychiatric conditions, enhancing patients' quality of life, and inspiring further innovations in the field of neuromodulation. With ongoing research and collaboration between multidisciplinary teams, the future of DBS holds great promise for transforming the lives of countless patients worldwide.

Keywords: deep brain stimulation, movement disorders, adaptive stimulation, frameless dbs, robotics, dti-tractography

012 USING MER TO IMPROVE DIRECT TARGETING IN DBS

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Accurate electrode targeting is one of the essential parts of successful deep brain stimulation (DBS). There is and ongoing debate about the necessity of microelectrode recording (MER) in DBS surgery to increase accuracy and outcome. With better preoperative imaging, intraoperative computed tomography (iCT), new lead and stimulator technologies it seems to be less and less necessary. We looked at our patient data for the last four years to assess accuracy in targeting and end position of the electrodes according to MER. We gathered our entire DBS patient group since 2014 to assess complication rate that might be attributed to using MER.

Our data shows increased accuracy that corelated with team experience and relatively low complication rate. With introduction of iCT and directional leads it is possible we can move away from using MER routinely without compromising patient safety. On the other hand, our data shows that when establishing a DBS program MER can be beneficial and increases accuracy.

Keywords: DBS; MER; microelectrode recording; direct targeting;

013 DIFFERENT OPTIONS IN THE TREATMENT OF TRIGEMINAL NEURALGIA. SIBERIAN EXPERIENCE

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Introduction: In accordance with the Classification of headache from 2018, several types of trigeminal neuralgia are currently distinguished, in this regard, approaches to the surgical treatment of this pathology have recently been reviewed and changed. A complex careful analysis of the history, complaints of the patient and clinical features of the disease and detailed neuroimaging data are important for making the right decision about choosing one or another type of operation.

Purpose: To demonstrate our tactics and results of different options in the treatment of trigeminal neuralgia.

Materials and methods: We performed a retrospective analysis of 609 cases of TN. All patients underwent surgical treatment in the Federal Center of Neurosurgery in Novosibirsk. The age of the patients ranged from 26 to 82 years (mean age – 56.9). Clinical diagnosis of TN was classified according to the International Classification of Headache Disorders as classical or idiopatic trigeminal neuralgia. All cases had received medical treatment that failed to control their symptoms. The pain syndrome intensity was assessed after admission to hospital and after surgery using pain scales and questionnaires such as Visual Analogue Scale (Huskisson EC et al., 1978) and the Barrow Neurological Institute Pain Scale (BNIPS) (Riesenburger RI et al. 2009). As a clinical routine for TN, pre-operative brain MRI sequences T1, T2 Axial, 3D TOF, FIESTA-C/CISS, and DTI were done for all cases to identify the relationships between the trigeminal nerve and the offending vessels. MVD was performed in 516 patients, transcutaneous destructions - in 93 patients.

Results: As a result of short-term outcome MVD evaluation (at 1-week post-operative) 92.3% cases were classified into success group (BNI score = I). In the early postoperative period the same pain was seen in 5.6% patients. As a result of the follow up within a period ranged from 1to 5 years (average: 4.8 years), 71.4% cases had achieved control of their pain, 62.8% being totally pain-free (BNI I) with an excellent result of the procedure and 8.6 % cases having a good result while still experiencing some form of mild pain but not requiring any medication (BNI II). 89% of patients in the early postoperative period and 57% of patients in follow up period by 86 months after transcutaneous destructions were free of pain.

Conclusion: In case of typical clinical symptoms of classical or idiopatic trigeminal neuralgia in the form of shooting facial pain, our tactic for today is to differentiate groups of patients according to the neuroimaging data, which takes into account, first of all, the degree of compression of the nerve root by the arterial vessel and its location in the REZ. These criteria are appropriate for MVD and make it possible to obtain good results of interventions. The transcutaneous destructions can be chosen in patients with idiopatic trigeminal neuralgia and lack of vascular compression determined on MRI and also in patients with multiple sclerosis.

Keywords: Trigeminal neuralgia, microvascular decompression

014 COMPLICATION AVOIDANCE IN FUNCTIONAL NEUROSURGERY

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Since 2014, we have performed first deep brain stimulation (DBS) surgeries and 63 stimulator replacement surgeries. We have documented 5 cases of stimulator site infection and a single case of electrode fixation site infection (6/159 DBS surgeries or 3.77 %), all of which occurred after primary DBS surgery. Furthermore, we documented one case of seroma over the stimulator site that required revision and one case of pronounced pneumocephalus.

We have had three cases of intracerebral bleeding, one occurred after thrombolysis due to massive pulmonary embolism, one occurred during microrecording and the last was incidentally discovered on a postoperative CT scan and was clinically irrelevant.

Since 2015, we have performed 54 first implantations of spinal cord stimulation (SCS) devices. During this period, we observed three stimulator site infections, two lead failures and a case of paraparesis because of epidural hematoma, caused by SCS lead injuring the radicular artery. In 7 other patients, the entire SCS system was removed because of lack of positive effect. Overall, the observed satisfactory effect rate was 74 %.

In our 20-year of experience with intrathecal baclofen therapy, we have implanted 126 devices for continuous infusion of baclofen into the spinal cord subarachnoid space. We have observed 21 cases of catheter complication (most common causes were catheter occlusion and migration), 14 cases of skin-related complications (most common causes were infection and necrosis) and 5 cases of pump-related complications (most common cause was motor malfunction).

In most cases of functional neurosurgery-related complication, no clear risk factors could be identified, but surgical technique, operative time, blood loss and patient nutrition status could be important. Our strategies to prevent functional neurosurgery-related complication are to use a dedicated surgical team with meticulous technique, to shorten the operative time, minimize the blood loss and implant an antimicrobial mash around implanted DBS and SCS stimulators.

Keywords: DBS; SCS; ITB;

015 TRUSTWORTHY AI FOR IMPROVING DIAGNOSIS AND TREATMENT OF SPINAL DISORDERS

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Spinal disorders are a major cause of disability and reduced quality of life for millions of people worldwide. The diagnosis and treatment of spinal disorders are often complex and challenging, requiring the expertise of multidisciplinary teams and the use of advanced imaging techniques and surgical interventions.

Artificial intelligence (AI) is a rapidly evolving field that has the potential to revolutionize the healthcare sector by enhancing the accuracy, efficiency, and accessibility of medical services. AI can be defined as the ability of machines or systems to perform tasks that normally require human intelligence, such as perception, reasoning, learning, decision making, and communication. AI can be applied to various aspects of spinal care, such as screening, diagnosis, prognosis, treatment planning, monitoring, and follow-up. AI can also help to reduce the variability, subjectivity, and bias that may affect human judgment and performance.

However, the adoption and implementation of AI in spinal care also pose significant challenges and risks. These include ethical, legal, social, and technical issues that relate to the trustworthiness, safety, reliability, transparency, accountability, and governance of AI systems. Trustworthy AI is a concept that aims to ensure that AI is aligned with human values and principles, respects human dignity and autonomy, protects human rights and interests, and promotes human well-being and social good. Trustworthy AI requires the involvement and collaboration of various stakeholders, such as patients, clinicians, researchers, developers, regulators, policymakers, and the public. This presentation provides an overview of the current state-of-the-art and future directions of AI applications in spinal care, as well as to discuss the opportunities and challenges of developing and deploying trustworthy AI for improving diagnosis and treatment of spinal disorders.

Keywords: machine learning; artificial intelligence; image analysis; computer-aided diagnosis; predictive modeling

016 THE EYES DO NOT SEE WHAT THE BRAIN DOES NOT KNOW

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The critical anatomical locations at the Skull Base will be presented, where the Cranial Nerves and/or arteries might be affectied: displaced and involved partially or destroyed to moderate/ critical extend. Expandig tumorous and/or vascular pathology does create critical conflict(s) with neighbouring normal structures, leading to symptoms (first) and later on to the evident neurological signs, necessitating active/adequate neurosurgical intervention.

Knowing of coursing of the CNs, the intracavernous ICA as well as the Skull Base bony protuberances and the dural structures limitation(s) and/or changes are of

crucial importance in normal and pathological condition. Neurosurgical intervention necessitates proper knowing of the anatomy, adequate preoperative images studies and microsurgery skills.

Keywords: Skull Base, Cranial Nerves, Intracavernous ICA

017 ENDOSCOPIC ENDONASAL SKULL BASE SURGERY: A JOURNEY THROUGH TIME

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The endoscopic endonasal approach, initially reserved only for sellar lesions, is a continuous evolving speciality of modern neurosurgery, which requires precise anatomical knowledge, technical skills and integrated appreciation of the pathology dealt with. During the last years, it has been gaining land thanks to the evolving ideas and surgical tools in a trial to attain the lowest rates of morbidity and mortality in a safe, feasible, limited, yet practical way. It has to be intended as the result of a evolutionary process rather than a revolutionary one, being developed through advances in medical sciences and surgical technique, innovations and technological progress. Nowadays, it represents a minimally invasive approach to deal with several diseases interesting mostly the entire skull base - namely the suprasellar, retrosellar and parasellar spaces ¬- obviating brain retraction. The endoscopic endonasal approach offers some advantages arising from the use of the endoscope itself: a superior close-up view of the relevant anatomy and an enlarged working angle with an increased panoramic vision inside the surgical area. The better identification of the bony anatomical landmarks allows the surgeon's orientation, offering the surgeon the opportunity to visualize safely and effectively the surgical field.

We have been employing the endoscopic endonasal technique since 1997 on more than 2000 patients aiming to remove first different sellar lesions and, recently, different skull base lesions. Though, we report our experience with the endoscopic endonasal skull base surgery throughout years at our School, The division of Neurosurgery of the Universita' degli Studi di Napoli Federico II -Naples, Italy.

Keywords: skull base surgery; endoscopic endonasal approach; transsphenoidal surgery

018 MANAGEMENT OF TUBERCULUM SELLAE MENINGIOMAS: INDICATIONS FOR SURGICAL APPROACH

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Introduction: Tuberculum Sellae Meningiomas (TSM) represent a surgical challenge due to their proximity to neurovascular structures as optic nerves and chiasm, anterior circulation and hypothalamus. Many transcranial approaches (TCA) have been described and are routinely used for the resection of tuberculum sellae meningiomas. TSM are often closely associated with cerebrovascular structures, and their removal has traditionally required a TCA . The endoscopic endonasal approach (EEA) is an alternative route, but its clear indication and long-term outcome are still discussed. A retrospective series of 47 patients with TSM, treated by a microsurgical pterional approach in 40 cases and 7 by an endonasal endoscopic approach is herein presented. The purpose is to attempt to clarify our choice of the surgical approach according to tumor and patient characteristics.

Methods: All patients underwent detailed neuroradiological and neuro-ophthalmological evaluations before and after surgery. A retrospective study was conducted analyzing the charts of the patients, including surgical, histological, follow-up records, and imaging studies.

Results: 40 patients were treated by pterional TCA and 7 by EEA. The surgical decision-making process was based on tumor characteristics, size, extention, optic canal invasion and vascular relationships. A gross total removal has been achieved in 33 of 40 cases (82.5%) treated by TCA and in 6 of 7 (85.7) treated by EEA. One patient of the EEA group had a fibrous tumor requiring a reoperation by TCA. A stable or improved visual outcome has been recorded in 31 of 40 (77.5%) of TCA cases and in 6 of 7 (85.7) EEA cases. At follow-up (mean 93.5 months) a recurrence has been recorded in 5 of 40 cases (12.5%) and in no EEA case with a reduced mean follow-up of 24 months. There was 1 (2.5%) surgical mortality in the TCA series and no death in the EEA case.

Conclusions: Comparison of endoscopic vs. TCA attempted in some retrospective studies did not reach significant results because of heterogeneous nature of the lesions and different characteristics of the patients. TCA approaches should be still considered the standard approach for the majority of TSM, according to tumor characteristics as size more than 2-3 cm., firm fibrous tumors, extention lateral to ICA, vascular encasement. Extended EEA are viable alternatives in hands of experienced surgeons in selected cases, as midline tumors, size less than 2-3 cm, medial optic canal invasion. Unroofing of the optic canal and meticulous respect of optic nerve microvasculature may be essential in order to obtain a good visual outcome. Undoubtedly, EEA reduces optic nerves manipulation. Advantages and limitations of TCA and EEA should be taken into account when dealing with TSM.

Keywords: Tuberculum sella meningiomas; Transcranial Approach; Endoscopic endonasal approach; surgical indications

019 THE CHALLENGE OF AWAKE BRAIN SURGERY IN A CONNECTOME-BASED SURGICAL APPROACH FOR LOW-GRADE GLIOMA

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For decades, low-grade gliomas (LGG) studies mostly focused on oncological considerations, whereas functional outcomes received less attention. Currently, because overall survival increased in LGG, quality of life including neurocognitive and behavioral aspects should be assessed and preserved more systematically, particularly regarding surgery. Indeed, early maximal tumor removal resulted in a greater survival, leading to propose “supra-marginal” resection, with excision of the peritumoral zone in diffuse gliomas.

To minimize functional risks while maximizing the extent of resection, the traditional concept of “tumor-mass resection” is replaced by a “connectome-guided resection” conducted under awake mapping, taking account of the inter-individual anatomo-functional variability of the brain. A better understanding of the dynamic interplay between LGG progression and reactional neuroplastic mechanisms, based on a meta-networking organization of neural processing, is critical to adapt a personalized multistage therapeutic strategy, with integration of functional neurooncological (re)operation(s) in a multimodal management also including repeated medical therapies. Because the therapeutic armamentarium remains limited, this paradigmatic shift aims of predicting one/several step(s) ahead the glioma behavior, its modifications, and the compensatory neural networks reconfiguration over time, to optimize the onco-functional benefit of each treatment taken in isolation and in combination with others, in human beings bearing a chronic tumoral disease while enjoying an active familial and socio-professional life as close as possible to their expectations.

Thus, new ecological endpoints such as return to work should be incorporated in future LGG trials. A “preventive neurooncology” might also be envisioned, by proposing a screening policy to discover and treat incidental glioma earlier. Remarkably, this approach allowed an improvement of both overall survival (over 20 years) as well as quality of life (severe permanent morbidity <1%, 95% of return to work) in LGG patients.

Keywords: Low-grade glioma; awake surgery; brain connectome; neuroplasticity; functional mapping

020 MODERN NEUROSURGICAL TECHNOLOGIES IN THE WORK OF BURDENKO NATIONAL MEDICAL RESEARCH CENTER FOR NEUROSURGERY

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1. Burdenko National Medical Research Center for Neurosurgery

National Medical Research Center for Neurosurgery named after Academician N.N. Burdenko was founded in 1932 and nowadays is the leading neurosurgical facility in Russia and the largest neurosurgery clinic in the world. Over the 90 years of its work, Center has established long-standing clinical and scientific traditions that ensure high level of diagnostics and treatment. Modern neurosurgery is based on the complex integration of fundamental and clinical neurosciences and technologies. A significant number of different diagnostic and therapeutic approaches are used in order to prolong the life of the patient. Large volumes of information about the state of the nervous system and its pathology, routinely generated in neurosurgery, attract specialists from related medical and biological sciences to conduct comprehensive studies. Such close cooperation of physicians, biologists, chemists, physicists, mathematicians, engineers and other specialists ensures the rapid and continuous improvement of methods of surgical treatment.

The Burdenko Neurosurgical Center works on three main directions — clinic medicine, science and education. The Center is based on 10 clinical departments for 358 beds and operation theater for 22 rooms. It has large neurointensive care unit for 38 beds. Annually in Center 13 000 inpatients are treated, 10 000 neurosurgical operations are performed, 2 500 radiosurgical procedures are done and more than 90 000 medical consultations are provided. Department of neuroradiology has innovative technologies including 5 MR scanners (including 1 intraoperative), 6 CT scanners (including 2 intraoperative), 2 DSA, SPECT and PET.

National Center for Neurosurgery provides the treatment of large range of neurosurgical areas and broad spectrum of pathology. Pediatric neurosurgery: brain and spinal cord tumors, including differential craniopharyngioma treatment under the guidance of the Honorary President, Professor, Academician of the Russian Academy of Sciences A.N. Konovalov (the world's largest series of over 4, 000 observations). Vascular neurosurgery (the founder of endovascular neurosurgery - Academician, Professor F.A.Serbinenko developed a technique for surgical treatment of cerebrovascular diseases - endovascular occlusion, reconstructive vascular surgery, targeted superselective catheterization). All spectrum of neurooncology including minimally invasive approach technology (key-hole and burr-hole surgery). Functional neurosurgery: neurosurgical treatment of extrapyramidal disorders and chronic pain syndromes. Neurotrauma: acute traumatic brain injury with invasive monitoring of intracranial pressure followed by specialized neurosurgical care, the consequences of craniocerebral trauma, bone defects of the cranial vault. Spinal neurosurgery: spinal cord and spine tumors, degenerative diseases, injuries and malformations. The Center's infrastructure also includes the essential units: radiotherapy, otorhinolaryngology, neuroophthalmology, psychiatry, neurorehabilitation and others. Intraoperative technologies include 2 intraoperative CT, intraoperative MRI, awake surgery, digital subtraction angiography device, neuroendoscopy, navigation technologies, intraoperative neurophysiological monitoring, laser fluorospectroscopy, computer modeling and laser stereolithography, neuromodulation.

So wide spectrum of modern neurosurgical technologies used in Burdenko Neurosurgical Center makes it possible to achieve high quality of neurosurgical help for patients with minimal rate of complications. Nowadays, along with impressive operative, advisory, and organizational activities, active development of new fields of neurosurgery is under way. The succession of generations allows us to preserve our memory and traditions and further develop achievements in cooperation with neurosurgeons from all over the world.

Keywords: neurosurgery, technology, neuroscience

021 INTRAMEDULLARY SPINAL CORD TUMORS: OUR VIEW ON SURGERY AND RADIOSURGERY

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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, in turn leads to a significant decrease in patient 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. Although surgery remains the mainstay treatment, radiosurgery can be a safe and effective option in selected cases. In our talk we describe our view on this topic.

Keywords: Intramedullary spinal cord tumors, surgical treatment, radiosurgery

022 OVERCOMING COMPLICATED KÜMMELL'S DISEASE: SINGLE- STAGE ROOT-SPARING CORPECTOMY AND STABILIZATION OF VERTEBRAL BODY

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Objectives: Posttraumatic delayed vertebral collapse, known as Kümmell's disease, is increasing in number of patients. This disease is already progressive kyphosis due to vertebral collapse at the time of diagnosis and it causes intractable pain or neurologic deficit due to intravertebral instability. Treatment is very difficult and debatable after progression of the disease, and the range of treatment, in hospital day, and cost of treatment are both increased. The purpose of this presentation is to suggest and share appropriate treatments for patients with posttraumatic delayed vertebral collapse to overcome fracture progression in complicated Kümmell's disease.

Materials and Methods: Ten patients with Kümmell's disease, out of total 42 patients with unstable thoraco-lumbar burst fracture, underwent single-stage posterior-only vertebral column resection and vertebral body reconstruction using an expandable cage and short segment fixation. Neurologic status was classified using the ASIA Impairment Scale, while functional outcome was analyzed using a VAS for back pain. Segmental Cobb angles were measured preoperatively, immediate postoperatively, and at the last follow-up.

Results: The preoperative neurologic status was ASIA grade E in 5 patients, grade D in 2, and grade C in 3. Postoperatively, neurologic stability was demonstrated in 7 patients (70.0%), and 3 (30.0%) showed improvement in the ASIA grade. The mean preoperative VAS score was 6.6, 3.2 at postoperative 1 month, and 1.4 at the final follow-up. The mean preoperative segmental kyphotic angle was -25.47°, which was reduced to -15.39° immediate postoperatively, and maintained as -16.92° at the last follow-up. There was no surgical complications, implant-related complications, or neurological deterioration in all patients.

Conclusions: The results of our series suggest the feasibility, efficacy, and safety of this surgical option for Kümmell's disease complicated with fracture progression. This technique from a single posterior approach offers several advantages over traditional anterior or anterior-posterior combined approaches using strut graft or nonexpandable implants.

Keywords: Intravertebral cleft, Kummell's disease, Osteonecrosis, Osteoporosis, Vertebral fracture, Posterior approach, Expandable cage, Transpedicular vertebrectomy

023 BRAINSTEM CAVERNOUS MALFORMATION RESECTION AND HOLMES TREMOR

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Object: Several teams report their experience with the surgery of brainstem cavernous malformation (BSCM; cavernous hemangiomas) without reporting on postoperative Holmes tremor (HT). Our purpose is to present our experience with HT in a monocentric series of resected BSCM.

Methods: We reviewed all the BSCM operated on between 2002 and 2023 in our department. A literature review was performed to compare our results with those in the existing literature.

Results: 22 BSCM were resected between 2002 and 2023 by the senior author (CR) using computer assisted navigation. The median preoperative mRS score was 1.59 (range 0-5). GTR was achieved in all patients without surgery-related death. BSCM were in the mesencephalon in 10 (45%) patients, pons in 8, myelencephalon in 4; 6 of them were also partially in the diencephalon. The median follow-up period was 5.07 years (range 0.25–19 years). At the last follow-up, 18% of our patients showed a worse mRS score, 45% stayed unchanged, and 36% improved. Five (22.7%) patients, 1 male and 4 females, with a median age of 51 years (range 29-59 years), developed a HT. Four of them (80%) had a mesencephalon located BSCM. One HT became subtle and is no more medicated. Two are medicated and two benefitted from a deep brain stimulation (DBS): one unilateral VIM and GPi as targets with 73% tremor improvement at last follow-up, the other one had a bilateral VIM DBS with a 10% improvement (FahnTolosa Marin tremor rating scale).

Conclusion: Our results are comparable to the largest series reported in the literature. We found an increased incidence of HT in patients with a BSCM located in the mesencephalon. A spontaneous favorable evolution is possible and treatment response is variable between patients.

Keywords: Brainstem, Cavernous Malformation, Cavernous Hemangioma, Holmes tremor

024 POST TRAUMATIC ANEURYSMS: RARE AND DEVASTATION CONSEQUENCES OF TRAUMATIC BRAIN INJURY

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Intracranial aneurysms are a rare, potentially life-threatening complication of a traumatic brain injury. Post- traumatic aneurysms represent less than 1% of all patients with cerebral aneurysms. These aneurysms can occur following blunt or penetrating head trauma and are described following both minor and severe traumatic brain injuries. They are more common in the pediatric population. A retrospective analysis of 17 cases that were managed at Children's Healthcare of Atlanta from Jan 1999 to December 2022, as well as a review of pertinent literature is the basis for this presentation.

Post traumatic aneurysms have varied clinical presentation but are most associated with an acute episode of delayed intracranial hemorrhage. The average time from initial trauma to aneurysm hemorrhage is approximately 21 days. The most common location is along the course of the anterior cerebral artery. Traumatic rarely occur at vessel bifurcations. Traumatic aneurysms can be categorized histologically as true, false, or mixed, with false aneurysms being the most common type. The natural history of untreated post traumatic aneurysms is progressive enlargement with a mortality rate as high as 50%. Prompt diagnosis based on arteriography and surgical or endovascular management are associated with better outcome than conservative treatment. It is noteworthy that surgery is associated with a high risk of intra-operative rupture and thus, appropriate anticipatory preparations should be made with preoperative planning.

The authors describe a classification scheme for traumatic aneurysms based on their anatomical location and conclude that

1) posttraumatic aneurysm must be considered in patients with acute neurological deterioration following closed head injury;

2) they can occur following mild closed head injury;

3) they occur more commonly in children than in adults; and

4) surgical clipping and/or endovascular occlusion is the definitive treatment.

Keywords: aneurysm; trauma; children

025 MICROSURGICAL TREATMENT OF ANTERIOR CIRCULATION ANEURYSMS - SINGLE CENTER RESULTS IN LATVIA

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Background: Although endovascular coiling have gained major popularity in the recent years, microsurgical clipping continues to be of value in the management of the anterior circulation aneurysms, since not all patients are suitable for endovascular treatment. The aim of this study is to report our department results of microsurgical clipping for ruptured and unruptured anterior circulation aneurysms in the last 5 years period.

Methods : This study included 105 patients with ruptured (77) and unruptured (28) anterior circulation aneurysms treated by two neurosurgeons with microsurgical clipping “between January 2018 and December 2022”. We retrospectively reviewed our medical files for clinical grades of the patients at the time of presentation according to the Hunt – Hess scale, the amount of blood at the initial brain computed tomography (CT) according to Fisher Grading Scale, any operative complications, evidence for clinical vasospasm and postoperative ischemia. Patients was analized with Glasgow Outcome Score (GOS) at the time of discharge from the hospital. Patients underwent surgical clipping after initial stabilization on the first scheduled operative day. Surgical technique included the either standard pterional approach or supraorbital approach with or without temporary clipping according to the surgeon preference. A follow- up brain CT was performed on the first postoperative day. Clinical vasospasm was reported in case of development of focal neurological signs or deterioration in the level of consciousness with exclusion of other causes of deterioration such as hydrocephalus, seizures, rebleeding, or electrolyte disturbance. Intra-arterial nimodipine were administered for the patients with clinical and radiological vasospasm.

Results: Ruptured aneurysms – 77 patients were included in the analysis. The median age of patients was 56.7 years (ranged from 36 to 84 years). Middle cerebral artery aneurysms (43.2%) and anterior communicating artery aneurysms (37, 8%) were most common. Majority of patients were in good (I-III) Hunt - Hess grades 48 (62.3%). Thirty five (45, 4 %) of the patients had Fisher grade II, 26 (33.7%) were Fisher grade III, and the remaining 16 patients were grade IV. Preoperative ventricular drainage was performed in 24 (31, 1, %) patients presenting with clinical and radiological signs of acute hydrocephalus, however, 6 (7.8%) required a permanent ventriculoperitoneal shunt. Clinical vasospasm was reported in 24 (31.1%) of the patients. At the time of discharge from the hospital 41(53, 2 %) patients had favorable (GOS 1-2) grades. The most important prognostic factor associated with favourable outcome was the preoperative clinical grading; however, it does not reach statistical significance ($p = 0.221$). Unruptured aneurysms – 28 patients were included in the analysis. The median age of patients was 54 years (ranged from 26 to 79 years). Middle cerebral artery aneurysms (71.4%) were most common. The overall surgical morbidity and mortality were 3.9 %. Risk factors for major morbidity were increasing age and increasing aneurysm size.

Conclusions: Microsurgical clipping results depends on various patient and aneurysm factors. Direct surgery still can be successfully used in the management of the ruptured and unruptured anterior circulation aneurysms.

Keywords: Clipping; aneurysms; single centre 166

026 ENDOVASCULAR TREATMENT OF MIDDLE CEREBRAL ARTERY ANEURYSMS – CURRENT TECHNIQUES

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Traditionally, middle cerebral artery (MCA) aneurysms have been considered as primarily surgical lesions, due to the challenging aneurysm anatomy at this location, and also to previous technical limitations of endovascular devices.The relatively superficial location of MCA aneurysms permits easy surgical access with minimal frontal or temporal lobe retraction. The implementation of intraoperative tools including continuous somatosensory evoked potential (SSEP) and electroencephalography (EEG) monitoring and indocyanine green (ICG) angiography, improve surgical outcomes by providing critical information regarding optimal clip placement. MCA aneurysms are mostly located on the proximal M1 or MCA bifurcation, which is relatively distal compared to common locations preferable for endovascular treatment. The majority of MCA aneurysms present a wide-necked base, that poses a difficulty for endovascular management. In addition, the visualization of MCA aneurysms may be relatively limited due to overlapping trunks of the MCA bifurcation or trifurcation on DSA. There is an increased risk of symptomatic thromboembolic complications due to the fact that MCA branches often supply eloquent cortex. Another hindering factor is what is called the wild morphological gallery of MCA aneurysm (Mansour et al. 2008). Despite technical disadvantages, emerging interest has arisen during the past two decades on the feasibility of coiling as an option in MCA aneurysm management. Continued innovations in endovascular techniques and devices were introduced to overcome these technical challenges, including balloon assisted coiling, stent assisted coiling, microcatheter improvement with increased inner diameter and flexibility, as well as introducing a new devices such as flow diverting stents, WEB device, pCONus, Pulse Rider and Barrel stent, Contour and Neqstent.

Patients and methods: Among 923 patients treated by the same author in our Department during last 12 years, there were 173 patients with MCA aneurysms harboring 175 aneurysms in this location. There were 48 ruptured and 127 unruptured aneurysms. Coiling was done in 131 patients, SAC in 12 patients, pCONus assisted coiling in 14 patients, flow diverting device was placed in 12 patients, WEB in 5 and Barrel stent in 1 patient.

Results: Good outcome was achieved in 75, 53%, mild neurological deficit in 7, 89%. 14, 28% had to be retreated and in 2, 28% we had mortal outcome (6, 25% in ruptured and 0, 78% in unruptured aneurysms). Overall morbidity was 7, 89% and mortality 2, 28%.

Conclusion: Most MCA aneurysms can be effectively treated with EVT, achieving satisfactory rates of occlusion with acceptable safety profiles and rates of favorable outcome. Progress in imaging and device manufacturing is providing more sophisticated tools that have expanded EVT to aneurysms that were previously neither surgically or endovascularily treatable. For ruptured aneurysms, clinical results are similar to those for aneurysms at other locations and also to those achieved in many surgical series.

Therefore, the endovascular approach to MCA aneurysms is justifiable. EVT of MCA aneurysms is safe and follow-up of patients show a low rate of recurrence requiring retreatment. However, complex anatomy and long-term recurrences have to be considered in making decision about optimal treatment for each patient with MCA aneurysm.

Keywords: Aneurysms, Endovascular treatment, Middle cerebral artery

027 ARTERIOVENOUS MALFORMATION, THE ROLE OF FLOW AND HEMODYNAMIC STRESSES

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Cerebral arteriovenous malformations carry a risk of intracranial hemorrhage, that is related to increase flow within the nidus, weakening of the vessel wall and/or increase in pressure locally. Risk factors for hemorrhage include venous stenosis, cerebellar location, deep location, and deep venous drainage. Traditionally, pre-operative embolization was performed to reduce the blood flow within the AVM nidus, thus making surgical resection safer and less bloody. Yet it was not possible to quantify the blood flow within individual AVMs. With recent advancement it is now possible to quantify the blood flow within the AVM nidus with quantitative magnetic resonance angiography. This is a non-invasive method that uses time of flight sequence and is used in pre-operative phase and post embolization. Quantitative data generated is being able to study and correlate with clinical presentation and AVM size. It appears that patients with seizures are on average larger in size and thus carry a larger amount of blood flow within the nidus. We were able to show that the blood flow per volume of AVM nidus is similar between patients who presented with hemorrhage vs those who presented with seizures vs. incidentally. Our data support that patients with feeder vessel aneurysms related to the AVM have higher averaged cross-sectional wall shear stress as compared to those without feeder vessel aneurysms. Also, it appears that the failure of the feeder vessels to compensate and dilate enough for increased flow might be the trigger factor for aneurysm formation secondary to disproportionality higher wall shear stress. Our pathological analysis on resected AVM specimen does demonstrate that the sum of the cross-sectional diameters of the vessels within the nidus is the driver for increase flow. Thus, the minimal resistance to AVM flow appears to be the diameter of the vessels within the nidus, not the entire AVM volume.

Similarly, sequential AVM embolization would result in decrease in AVM nidal flow and marked reduction in the wall shear stress in the feeder vessels. This phenomenon would explain why feeder vessel aneurysm might regress with time after AVM treatment. Our quantitative data suggest that embolization of single intra-nidal fistula would result in substantial reduction in flow within the AVM, by at least 30%, without reducing the entire volume of the AVM a lot. Because oftheabilitytofollowtheAVMflowpreandpostembolization.This datacanbeusedtomonitor response to the embolization and guide the surgeon in performing a sequential flow reduction in a safe manner. Using this methodology in our center have shown that the risk of post embolization hemorrhage is minimal in our group. Our data also does support previous literature that venous stenosis is a major risk factor for hemorrhagic presentation in cerebral AVMs. Further analysis does show that atherosclerotic risk factors like hypertension and high cholesterol does increase the risk of venous stenosis. Although the quantitative magnetic resonance angiography provides quantitative measurement for the AVM blood flow, semi-quantitative methods like contrast-transient time on angiography can give a relative semi-quantitative way to estimate blood flow within the nidus and follow on that post embolization. Understanding the basic hemodynamics of cerebral arteriovenous malformations is essential for safe and effective treatment.

Keywords: Arteriovenous malformation: Cerebral blood flow; Magnetic Resonance Angiography; NOVA; Embolization

028 BASIC TECHNIQUES OF ANEURYSM SURGERY: TIPS FOR YOUNG NEUROSURGEONS

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With the increasing number of diagnostic neuroradiology facilities especially in developing countries, more and more cases of SAH with ruptured aneurysms are found in hospitals. As neurosurgeons, we are increasingly required to be able to comprehensively handle ruptured aneurysm cases with optimal outcomes.

Endovascular treatment requires facilities and equipment that are quite expensive, which creates problems in the field. Open surgery for aneurysm occlusion is the best option for management in areas or hospitals with limited facilities. It is time for young neurosurgeons especially in developing countries to have the basic skills to perform aneurysm clipping surgery with its variations. In this presentation, basic techniques and tips for aneurysm clipping surgery will be presented, based on the author's knowledge and experiences in the open surgical treatment of cerebral aneurysms. Movies and a brief explanation of the operative technique will be also delivered.

Keywords: Cerebral aneurysm, clipping surgery, basic technique

029 CURRENT STATUS OF UK CLINICAL TRIALS

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Research is crucial for the survival, growth and expansion of neurosurgery. A survey of neurosurgical articles published between 1996 and 2009 identified that 38% of research was conducted in the US, with just 2 EU countries listed in the top 5 (Germany 6.3% and the UK 4.2%)1. Furthermore most randomised controlled trials were small and single centre2. There is also a need for appropriate avenues of funding to be widely publicised and easily accessible. In 2012 the Royal College of Surgeons (England) established a surgical clinical trials initiative to promote trials across all specialties which led to a significant increase in surgical trials.

The UK Trainee collaborative was established in 2014 and currently forms an excellent basis for promoting clinical research and engaging trainees as joint principal investigators, this has significantly enhanced recruitment to UK trials.

Other methods employed to promote research include, a dedicated section on the UK neurosurgical website which contains a directory of neurosurgeons with associated subspecialty research interests and regular updates of recruitment and trials status at national and international platforms.

Published UK trials have influenced change in practice across all subspecialties. To date there are 9 multicentre trials registered on the UK website and an additional 6 in set up.

We aim to increase awareness and participation in neurosurgical research without developing trial fatigue.

Keywords: clinical trials; neurosurgery

030 NEW FRONTIERS IN IMMUNOTHERAPY FOR BRAIN TUMOURS

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Despite many technical advances in neurosurgery, the prognosis for patients with malignant brain tumours and in particular high grade gliomas remains poor. For example, since the introduction of Stupp protocol, with concomitant temozolomide chemoradiation therapy followed by 6 cycles of adjuvant temozolomide for glioblastoma nearly 20 years ago, there has been little in terms of impactful novel therapies for these patients. Immunotherapy is now opening new avenues with promising results for this cohort of patients. Dendritic cell vaccine, perhaps holds the biggest promise here. In this invited lecture the emerging role of immunotherapy, and in particular dendritic cell vaccines, in the management of high grade gliomas is explored.

Keywords: Glioma; immunotherapy; dendritic vaccine

031 PROGRESS AND FUTURE DIRECTIONS IN CHRONIC SUBDURAL HAEMATOMA MANAGEMENT

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Introduction: Chronic Subdural Haematoma (CSDH) has become a pathology of increasing scientific interest. This is due to its growing incidence in relation to the aging population but also progress in understanding about its inflammatory origins and the application of novel therapies.

Methods: A summary of recently reported and current clinical trials and research in CSDH and how this influences patient management, outcomes and future research questions.

Results: Surgery remains the mainstay of treatment in this pathology, with a focus on how to prevent CSDH recurrence at the centre of many trials. Burr hole drainage and post-operative subdural drains for a minimum of 24 hours appears to be a relative standard of care, with some alternative surgical techniques also used. Several large studies concur on the harm of steroids as a treatment or adjunct in CSDH but there are still questions surrounding how to target the underlying inflammatory pathology and whether this could reduce recurrence or negate surgery. Middle Meningeal Artery (MMA) embolization has grown in popularity as a minimally invasive alternative or adjunct to surgery to reduce recurrence but there is still some debate about its evidence base. There are still many aspects of patient care and outcomes which need further investigation, including management of anti-thrombotics, long-term cognitive outcomes and management strategies in the severely frail patient.

Conclusions: Despite a growing body of literature on CSDH there are still some gaps in understanding about the exact pathological mechanisms and there remains no good pharmacological therapy. Optimising surgical interventions and post-operative care has been the key area of progress in CSDH management but perhaps a more bespoke patient-specific treatment algorithm is required, amalgamating surgical and minimally invasive techniques in relation to baseline patient and imaging factors.

Keywords: chronic subdural haematoma; trauma; elderly; head injury

032 PICKING WINNERS IN GERIATRIC NEUROSURGERY

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Our neurosurgical population is ageing so it's critical that we better understand how these older and frail patients benefit form our expertise. The neurosurgical literature and clinical trial registries are dominated by protocols randomising different surgical interventions in these older and frail patients. Little research focuses on determining which patients are actually likely to benefit from surgery, and where patient outcomes could be better without surgery.

We lead the UK multi-centre Duration of External Neck Stabilisation study. Older and frail patients with a new odontoid fracture are randomised to management in a collar or without a collar. The primary study outcome is quality of life. This cohort of patients has high levels of morbidity and mortality, irrespective of treatment modality. Bony fracture healing is uncommon, without evidence of harm to patients. For this reason management without a hard collar may be preferable if it increases patients quality of life, without increasing harm.

Stratifying older and frail patients for treatment benefits from rapidly implemented, accurate tools for estimating outcome. As an example, we developed the GCS-pupils score, and GCSP age charts which provide simple, rapid, but accurate estimation of a patients likely out functional and survival outcome at 6 months. Applying this strategy across cancer types may improve patient selection, care and outcomes.

Keywords: frailty; prognostication; odontoid fracture; collar; tumour; trauma; GCS; GCSP

033 TECHNICAL ADVANCES IN DEEP BRAIN STIMULATION

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There has been rapid development in the field of deep brain stimulation in the last decade. This invited lecture aims to review these, particularly with respect to topics such as electrode design, range of implantable pulse generators available, new modes of stimulation, the sensing technology, programming platforms including remote programming features, and new hardware optimising the surgical workflow. Future directions for the technology are also explored.

Keywords: deep brain stimulation; technology

034 ANTERIOR SKULL BASE TUMORS: MOVING TOWARD NEW APRROACHES

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The standard approach to the sellar region can extend to lesions placed in the midline from the cribriform plate to the inferior third of the clivus or laterally to the cavernous sinus or optic canal. This presentation aims to show a series of lesions suitable for an extended endonasal endoscopic transsphenoidal approach (EEETA). We presented numerous and selected lesions in and around the sellae and clivus operated by this variant of traditional transsphenoidal access.

Methods: From 2014. to 2022., extended endonasal endoscopic transsphenoidal approaches were used in select cases to reach some lesions in and around the sella, preferentially placed in the midline and anteriorly.

Complications after ETSSA	Nº of patients
CSF leak	3 pituitary, 1 chordoma, 1 esthesioneuroblastoma, 1 craniopharingioma
Sixty nerve deficit	2 chordoma, permanent 1
Cavernous sinus carotid artery lesion	1 pituitary tumor, 1 chordoma
Permanent diabetis insipidus	2 craniopharingioma
Hemiparesis after Carotid lesion	1 chordoma
Meningitis after CSF leak	1 esthesioneuroblastoma
Total	14

Mortality 1 pte clival meningioma .
Reoperation 1

Extension of removal	Types of tumors. Nº of patients	Total removal	Subtotal removal	Parcial removal.Less than 50%
Tuberculum sellae meningioma, diafragma and planum sphenoidal	8	4	3	1
Orbital meningioma	1	1		
Esthesioneuroblastoma	2	1	1	
Adenoid cystic carcinoma	1		1	
Sellar and parasellar lesions				
Pituitary tumors with cavernous sinus invasion	26	10	10	5
Hypotalamic granuloma	1		1	
Craniopharyngioma	12	7	4	1
Rathke Cyst	2	2		
Sphenoid mucocele and frontal	4	4		
Linfoma invading cavernous sinus	1	1		
Clivus chordomas	11	4	5	2
Clivus hamartoma	1	1		
Retroodontoid synovial cyst	1	1		
Pleomorfic xanto astrocytoma	1	1		
Plasmocitome	2		2	
Cavernous sinus hemangioma	1		1	
Fibrous dysplasia	1	1		
Clivus Meningioma	4	2	1	1

Results: From 2014. to 2022., 80 patients were operated through the EEETA for the following lesions: 26 cases of pituitary adenomas expanding laterally and invading the cavernous sinus, 01 hypothalamic granuloma, 12 craniopharyngiomas, 02 cases of Rathke cyst, 04 cases of sphenoid sinus mucoceles, 1 case of linfoma invading the cavernous sinus, 8 patients with tuberculum /diaphragm sellae meningiomas, 1 case of adenoid cystic carcinoma, 02 cases of esthesioneuroblastoma, 01 case of clivus hamartoma, 1 case of orbital meningioma, 1 case of fibrous dysplasia involving the clivus, 11 clivus chordomas, 4 cases of clivus meningiomas, 1 patient with retroodontoid synovial cyst, 1 patient with recidive of the pleomorphic xanthoastrocytoma through the nose, 2 plasmacytoma, and 1 with cavernous sinus hemangioma. One patient with clivus meningioma died due to a late recurrence of the tumor. Two patients had carotid artery bleeding, and one had permanent hemiparesis after carotid artery ligation. CSF leak committed six patients, and one required a new surgery to close the leak. Permanent neurological complications included two cases of craniopharyngioma with diabetis insipidus, and one with permanent 6o nerve deficit.

Conclusion: In carefully selected patients, EEETA can treat certain tumors in and around the sella. They offer safe and minimally invasive alternatives to transcranial approaches to resected tumors from the cribriform plate to the inferior third of the clivus, preferentially situated anterior and in the midline. The rate of complications was lower and didn't alter the successful course of the patients.

Keywords: Pituitary; Chordomas; Meningiomas; Craniopharingyoma; Endoscopy; Endonasalaringiomas, ItntPituitary, Chordomas, Meningiomas, Intracranial tumors, Endoscopy, Transsphenoidal Endoscopy, Transsphenoidal

035 ANATOMY AND APPROACHES TO CV JUNCTION

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The craniovertebral junction (CVJ) represents a complex and critical anatomical region where the skull and upper cervical spine converge, facilitating essential functions such as head movement and neural communication. This abstract provides a concise overview of the intricate anatomy of the CVJ and highlights the various surgical approaches employed in its management.

The CVJ consists of the occipital bone, atlas (C1), axis (C2), and associated ligaments, muscles, and neural structures. Understanding its intricate anatomy is paramount for surgeons when addressing congenital anomalies, trauma, and degenerative conditions that can affect this region.

Surgical intervention at the CVJ necessitates meticulous planning and execution, as it involves addressing a range of pathologies such as atlantoaxial instability, basilar invagination, and Chiari malformations. Surgeons have devised several approaches, including the transoral, transnasal, far- lateral, and posterior approaches, each tailored to specific conditions and patient characteristics. Advances in minimally invasive techniques have also expanded the surgical armamentarium, allowing for reduced morbidity and faster recovery.

In conclusion, a comprehensive understanding of CVJ anatomy and familiarity with diverse surgical approaches are crucial for achieving optimal outcomes in patients with CVJ pathologies. Ongoing research and technological advancements continue to refine surgical techniques, enhancing patient care and quality of life.

Keywords: CVJ; Anatomy; Approaches; Craniovertebral junction;

036 MANAGEMENT OF SMALL AND LARGE PETROCLIVAL MENINGIOMAS

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Background: Surgical management of petroclival meningiomas (PCMs) remains a challenge due to their close association with neurovascular structures and their complex anatomy. Radicality of removal and functional outcomes are poorer in large, recurrent, and irradiated cases.

Objective: To compare radicality of surgical resection and functional outcomes of a series of patients with large PCMs (diameter >3 cm) with a series of patients with small PCMs.

Methods: Patient charts and imaging data of 130 consecutive patients with PCMs treated at our institution were reviewed. Tumors were stratified by size in two subgroups: large tumors (diameter>3 cm) and small tumors (diameter<3 cm). Functional outcomes and postoperative complications were compared. Different surgical approaches were used and tumor resection using fluorescence with 5-ALA was employed in the last cases.

Results: There were 95 patients with large tumors and 35 with small tumors. 123 patients underwent one-stage and 7 two-stage resections. The most frequent surgical approach used was the retrosigmoid. In all series gross total resection (Simpson's grade 1 & 2) was achieved in 64 patients (49%). In small tumors, gross total resection was possible in 34 patients (97%), Simpson's grade 1 (28 patients) and Simpson's grade 2 (6 patients). Mortality was 1.5% in the total series and 0% in the small tumor group. Morbidity and new postoperative cranial nerves deficits were 24% and 40%, in all cases, respectively. In small tumors mortality and new postoperative cranial nerves deficits were 0% and 2% respectively. Surgical removal utilizing fluorescence with 5-ALA was helpful to identify tumor remnants.

Conclusion: Surgical resection of PCMs remain surgically challenging, but outcomes are improving with surgeon experience and new tools. Radical surgical removal is the only option of cure. Small tumors offer the best chance of radical removal and functional outcomes. Radiosurgery is usually indicated to treat small PCMs. Results of radiosurgical series should be compared with surgical series including only small tumors and not with series that include large and small tumors.

Keywords: Meningiomas, Petroclival meningiomas, Small tumors, Retrosigmoid approach

037 MYTHS ABOUT VESTIBULAR SCHWANNOMA SURGERY AND TECHNICAL PEARLS IN FACIAL NERVE PRESERVATION

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The author who has an operative experience of more than 1000 CP angle tumors, including 835 vestibular schwannomas, in this presentation, describes the technical details of facial nerve preservation in vestibular schwannoma surgery. A proper understanding of the site of origin of vestibular schwannomas and their relation to arachnoid, is of paramount importance for successful functional preservation of cochlear and facial nerves during surgery. It is commonly believed that these tumors arise from areas close to glial-Schwann sheath junction and this transition zone is called the Obersteiner – Redlich zone, and for the vestibular nerve it is situated at or medial to the porus of internal auditory canal (IAC).

Sporadic eighth nerve schwannomas can arise at any location on the axons from this transitional zone up until their termination within the labyrinth. While intralabyrinthineschwannomas are rare tumors that arise from the neural sheaths inside the bony labyrinth, most of the traditional vestibular schwannoma arises within the lateral or middle part of IAC close to area of the glial-schwann cell junction. Presently we know that the arachnoid of the acoustic-facial cistern which houses the Scarpa's ganglion and the facial and vestibulocochlear nerves extends up to the far lateral end of IAC. The nerves pierce this arachnoid immediately after entering the fundus of the IAC and thus there is no epiarachnoid segment of the nerve at the fundus. Hence any tumor which originates in the IAC with rare exceptions, is presumed to be in subarachnoid location. This 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 and as they grow, they push the arachnoid inside the IAC towards the cerebellopontine angle. This arachnoid then gets juxtaposed to the parietal arachnoid of the acoustic facial cistern so that any surgeon who operates through a retrosigmoid or translabrynthine route has to peel these double layer of arachnoid over the tumor surface at surgery. But presently a subarachnoid concept of origin has been postulated. This can be easily understood because of the following observations that were made. A cut section from the surface of the tumor obtained after peeling away the double arachnoid layer, when examined under microscope, revealed another arachnoid layer over the surface. On the other hand if the tumor was indeed epiarachnoid in origin, then after dissecting the intrameatal part of the tumour, the nerves inside the canal should be covered by an arachnoid layer, which is hardly ever found at surgery. If one postulates a subarachnoid origin of these tumors inside IAC, what then is the mechanism of formation of arachnoid fold over the surface in the cisternal portion of the tumor? In actuality, 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 brainstem resulting in an overlap of arachnoid membrane and this is what a surgeon sees as a double layer of arachnoid upon gently retracting the cerebellum at surgery.

However contrary to the epiarachnoid concept, at surgery this arachnoid fold cannot be kept over the tumor throughout surgery, and a stage comes when one has to enter the subarachnoid space. This is the point where the continuity between the arachnoid fold and the arachnoid membrane over tumor surface breaks and surgeon enters subarachnoid space. The essential understanding needed to successfully execute surgery on a vestibular schwannoma is to realize that the perinurium 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. Furthermore, the first important step during the surgery is to peel the arachnoid overlying the posterior surface of the tumor in the form of a dual layer, while keeping in mind that a vestibular schwannoma which arises from in the subarachnoid space has no arachnoid which separates it from facial and auditory nerve and hence a very meticulous technique is required to safely dissect the nerves from the tumor capsule. The intracanalicular component of the tumor is removed by performing a tailored drilling of internal auditory canal. Intraoperative neuromonitoring of both cochlear and facial nerves is essential for functional preservation. The key procedures for functional preservation surgery are bloodless microdissection, progressive debulking, capsular elevation to locate the facial and cochlear nerves both electro-physiologically and microscopically, sharp dissection of the facial and cochlear nerves, using SS forceps and avoidance of heat and mechanical injury not only to the nerves, but also to the internal auditory artery, and the brain stem. Total resection may not be feasible in some cases, especially the cystic ones, and surgeons should realize that discretion is the better part of valor in these cases. If the tumor cannot be dissected from 7th and auditory nerve easily, a sub-perineural dissection is advised.

Our understanding of the microsurgical anatomy of the cisternal spaces, its contents, the site of origin of this tumor and its relationship with the arachnoid anatomy have significantly improved the surgical extirpation of even larger tumors with functional preservation of not only 7th nerve but also the 8th nerve in selected cases.

Keywords: vestibular schwannoma; epiarachnoid; subarachnoid; seventh nerve

038 SMALL AND MID-SIZE ACOUSTIC NEUROMA: WHEN AND WHY I DO SURGERY?

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Currently, EANO guidelines recommend, for small vestibular schwannoma, observation or radiosurgery, considered superior to microsurgery.

Both SRS and surgery carries a low risk of facial nerve damage and may provide long-term control or cure, respectively. Factors like previous irradiation, continuous growth after SRS, hearing status or patients' will, after explanation of the case, and vertigo may be indications favouring surgery.

Intra-operative neurophysiological monitoring with EMG-free run, Transcranial - Motor Evoked Potentials of facial nerve, direct facial nerve stimulation and Brainstem auditory evoked potentials are mandatory in this surgery. Altogether, this situation should be meticulously discussed with the patients and all options explained.

In tumours reaching the brainstem we usually decide for surgery. Nevertheless thourough discussion of severals options with the patient is mandatory.

Keywords: acoustic neuroma, surgery

039 TUMOR-ASSOCIATED EPILEPSY AND EPILEPSY-ASSOCIATED TUMORS

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The clinical course of many brain tumor patients is complicated by seizures. Incidence rates vary from 25-50% in cases with brain metastases, meningiomas and glioblastomas to > 70-90% in patients with low(er) grade gliomas and some glioneuronal brain tumours such as gangliogliomas and dysembryoplastic neuroepithelial tumours (DNTs). Together with a few other neuroepithelial tumors (e.g. pilocytic astrocytoma, pleomorphic xanthoastrocytoma, angiocentric neuroepithelial tumor/ANET) these latter entities commonly present with pharmacoresistant epilepsy, often involve the temporal lobe, follow a benign clinical course, and because of these similarities have been referred to as LEATs (longterm epilepsy associated tumours). However, recent molecular genetic research has provided no evidence in favour of the concept of a specific LEAT biology.

Surgical treatment for tumors with tumor-associated epilepsy ideally aims at both, tumor and seizure control. Following complete resections, epilepsy control rates in the range of 70-80% have been reported in uncomplicated cases for an increasing number of tumor entities. Surprisingly similar results are obtained in cases with pharmacoresistant epilepsy, however these patients may require a more complex approach, i.e. epilepsy surgery. Epilepsy surgery aims at resecting not only the tumor but also the epileptogenic zone, and patients usually undergo a presurgical epilepsy work-up for the identification of the epileptogenic zone which includes specialized neuroimaging, video-EEG monitoring and occasionally even the placement of depth electrodes.

From a neuro-oncological perspective, the functional anatomy-based epilepsy surgery approach results in supramarginal resections which should translate into superior survival in tumor patients. Preservation of neurological function is sometimes an even greater concern to the epilepsy than the neuro-oncological surgeon, and better epilepsy control improves the quality of life of tumor patients. Less complicated epilepsies do not require a very complicated epilepsy work-up. Therefore, combining tumor and epilepsy surgery concepts may be a promising strategy also in patients with brain tumors and seizures who are not traditional epilepsy surgery candidates.

Keywords: brain tumor; LEAT; epilepsy; epilepsy surgery

040 GIANT VESTIBULAR SCHWANNOMAS-MODIFIED SURGICAL TECHNIQUE FOR FACIAL NERVE PRESERVATION

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Introduction: Surgical excision of giant (> 4cms size) vestibular schwannomas (VS) with preservation of facial nerve (FN) function remains a challenge. We used an extra-arachnoid plane of dissection and limited meatal drilling with the goal of FN preservation.

Methods: Surgical results with respect to FN preservation were analyzed for patients with giant vestibular schwannomas operated between 2009-2016 using extra-arachnoidal dissection and limited meatal drilling. All patients had a minimum follow-up of one year.

Results: Of 98 patients, total excision was achieved in 70 (71.4%) patients, near total in 9 (9.2%) and subtotal in 19 (19.4%). Four patients had repeat surgery; 14 underwent gamma knife radiosurgery. At > 6-month follow-up, 78 (79.5%) patients had good FN function (H&B grade 1-2), while 20 (20.4%) had poor function (H&B grade 3-5).

Conclusions: With our 'modified' surgical technique of extra-arachnoidal dissection of VS throughout surgery and limited meatal drilling, facial nerve preservation was achieved in majority of patients with giant vestibular schwannomas

Keywords: Giant vestibular schwannomas; facial nerve preservation; meatal drilling; extra- arachnoid dissection

041 THIRD VENTRICLE SURGERY: ENDOSCOPIC AND MICROSCOPIC APPROACHES, ADVANTAGES OF VENTRICULOPORT TECHNIQUE

Bulent Duz

Interhemispheric transcallosal approach, Translaminaterminalis approach, transcorticai endoscopic approach and endoscopic endonasal appraches are the possible corridors to access into third ventricle. Approaches to third ventricle need retraction and dissection of eloquent brain structures because of the central location of the ventricles. Ventriculoport technique allows both endoscopic and microscopic visualization of ventricles and gives opportunitiy of using classical microsurgical instruments together with some minor modifications. Because of that ventriculoport usage has its own advantages over classical microsurgical and endoscopic techniques. Ventriculoport allows tubular retraction and protects brain tissue from undesired laceration of retraction blade edges. 4 mm Telescope is used in the ventriculoport which allows more clear and wide exposure in comparison with classical endoscopic approach. Endoscopic microneurosurgery is emerging inside the ventriculoport technique.

Keywords: third ventricle, neuroendoscopy, ventriculoport

042 REVIVING MATRIX FOR RECONSTRUCTION OF PERIPHERAL NERVES WITH MASSIVE LOSS DEFECT

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Aim: Guiding Regenerative Gel (GRG) and Anti-Gliotic GRG (AGRG) were developed to support axonal growth, overcome astro-glial scar barrier and serve as a regenerative and repair source for nerve tissue reconstruction.

Materials: Efficacy of GRG and AGRG for peripheral nerve (PN) reconstruction was evaluated: - in acute rat PN injury model

- in chronic rabbits PN injury model (2 months post injury).

Results: Peripheral nerve reconstruction I- Rat Model: In vivo study on PN with massive nerve loss showed that GRG loaded into a commercial-collagen tube enabled massive growth of myelinated axons and continuation of axonal sprouting through the tube to the distal part of the nerve in a 15mm long nerve gap in comparison with bridging with an empty tube. In a 6 months study, the GRG was shown to exhibit regaining of function to the paralyzed limb.

II- Chronic Rabbit Model: In a long-term (8 months) study on PN with massive nerve loss and reconstruction 2 month post injury (representing human condition: chronic, large gap), GRG and especially AGRG loaded into a commercial-collagen tube enabled massive growth of myelinated axons and continuation of axonal sprouting through the tube to the distal part of the nerve in a 25mm long nerve gap, enhanced significantly in comparison to bridging with an empty tube.

Conclusion: These results highlight AGRG potential to promote regeneration of nerve tissue. Keywords: Peripheral Nerve Injury; Matrix for Reconstruction

Disclosure: The study was funded and supervised by Baxter International Inc and was conducted at MD Biosciences (CRO).

043 COMPLICATIONS OF MODELING SUBSTANCES AFFECTING PERIPHERAL NERVES

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Many materials, adjuvants or modeling substances have been used to illegally mold the body shape. These adjuvants can induce autoimmunity by themselves, and can be contaminated with other substances that potentiate their ability to induce an inflammatory response. The clinical spectrum is very heterogeneous and varies between mild and severe systemic and local symptoms, ranging from days to years. So, the various inflammatory entities related to modeling substances can be considered a spectrum of the same immunological process of variable intensity and host response. Its use with aesthetical purposes is a serious problem with multiple faces that can also affect peripheral nerves, requiring a multidisciplinary team for approach and management.

Nowadays, it seems to behave as a compressive neuropathy with no toxic adverse effects other than inflammatory response. Thus, the clinical identification of suggestive signs of compression remains the cornerstone for diagnosis, but electrodiagnosis and radiologic investigations are essential. Appropriate surgical management should consider adjuvant characteristics, disease features, and the need for soft tissues reconstruction, in order to avoid postoperative infection, wound dehiscence and to anticipate loss of tissue. So, the surgeon should be aware of this condition with the aim to in-time resolve nerve complications avoiding permanent deficit.

Keywords: Modeling substances; Peripheral nerve injury; Human adjuvant disease; Injected silicone; Silicone granuloma.

044 THORACIC OUTLET SYNDROME: DIAGNOSIS, MANAGEMENT AND INDICATION FOR SURGICAL TREATMENT

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The thoracic outlet syndrome (otherwise known with its acronym TOS) is an entrapment syndrome involving the neurovascular bundle for the upper limb along its course from the cervical spine to the axilla.

Three clinical forms of TOS are described: arterial, venous and neurogenic TOS. The two vascular forms are uncommon whereas the neurogenic form represents the most statistically relevant clinical presentation (more than 90% of cases). Although neurogenic TOS may be associated with the development of neurological deficits, the vast majority of cases only present "irritative" symptoms (pain and paresthesia radiating along the upper limb, mostly along the ulnar distribution) and no neurological deficits. The latter from of neurogenic TOS is a "dynamic" entrapment: symptoms are triggered by prolonged or repetitive movements implying shoulder abduction, a situation that triggers the onset of progressively worsening pain and paresthesias along the limb, mainly along the ulnar distribution.

Differently from other entrapments, electrodiagnostic tests result unremarkable and this may contribute to make the diagnosis of TOS extremely difficult for unexperienced physicians. As a matter of fact, the absence of anomalies on EMG/NCS has prompted many neurologists to even deny its very existence; thus, TOS without neurologic deficits still remains a controversial pathology, its incidence is likely to be underestimated and indication for surgery is seldom advocated. Neurogenic TOS should be suspected in all cases of non discogenic brachialgia, especially when on neurological examination positive Roos test, supraclavicular Tinel sign and traction test are detected; this triad of provocative tests has proved significantly consistent with the diagnosis of neurogenic TOS and is therefore to be considered reliable for the clinical diagnosis of neurogenic TOS.

A dynamic MRI study of the brachial plexus represents the core of the diagnostic workup in these cases; despite the possibility of false negatives, this method of investigation usually provides evidence of the compression on the neurovascular bundle during shoulder abduction. TOS may often be treated conservatively; however, indication for surgery should be advocated in cases with long dating or particularly severe symptoms. Surgical treatment is generally extremely beneficial, followed by favorable outcome with significant subsidence/ resolution of preoperative symptomatology.

The author presents her experience in the diagnosis and management of neurogenic TOS without neurological symptoms.

Keywords: thoracic outlet syndrome; dynamic mri; brachial plexus; anterior supraclavicular approach

045 LIFE QUALITY AFTER DECOMPRESSION OF THE PUDENDAL NERVE – IS SURGERY A VIABLE THERAPEUTICAL OPTION?

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Introduction: Pudendal neuralgia can be caused by a rare nerve compression. Affected patients suffer severe impairment of their social and personal life. Surgical decompression of the nerve is a treatment option. We evaluated patients' satisfaction after surgery.

Material and methods: Retrospectively, we analyzed patient data and patients' satisfaction using an adapted questionnaire.

Results: From 2015-2023 n=33 patients were operated for pudendal neuropathy (with a total of n= 59 pudendal nerves). Of these, n=25 patients (n=29 nerves operated on) could be included in this retrospective study. Mean age was 54 years, n=15 were female, n= 10 male. Pre-OP symptoms were pain in n=25, sensory deficits in n=5 and motor deficits in n=6 patients. All patients received a preoperative, diagnostic pudendal nerve block. In n=29 procedures a dorsal transgluteal decompression (n=13 unilateral/ n=12 bilateral), and in n=4 a paraperineal approach (n=2 unilateral/ n=2 bilateral) was performed. Compression site consisted in n=15 in a hypertrophic sacrotuberal ligament. In n=16 cases we encountered additional pathologies: n=11 scarring, n=2 fibrous bands, n=2 sacrospinal ligament compression, n=1 perineural varicosis. No perioperative complications occurred. Overall postoperative pain intensity dropped significantly from 7.96 on Visual Analogue Scale (VAS) to 5.96 ($p<0.0002$). N=11 patients significantly ($p<0.0145$) improved their free time life activity. Overall well-being increased significantly ($p>0.0001$) in n=17 patients.

Conclusion: In our experience, surgical pudendal nerve decompression led to a significant improvement in patient's life quality. Careful patient selection and meticulous workup are mandatory for a successful treatment. Further studies with larger patient groups and longer follow-up are required.

Keywords: pudendal nerve, surgery, pain

046 DECOMPRESSION OF THE TIBIAL NERVE WITHIN THE FOUR MEDIAL ANKLE TUNNELS ENHANCES BLOOD FLOW AND PROMOTES CHRONIC WOUND HEALING IN PATIENTS WITH DIABETIC NEUROPATHY

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Introduction: This study aims to examine the potential effects of decompressing the tibial nerve on enhancing sympathetic nerve function in patients with diabetic neuropathy, resulting in improved blood flow and accelerated healing of ulcers.

Methods: A prospective study was undertaken involving 12 patients diagnosed with non-healing diabetic neuropathic ulcers, with an average duration of 13.7 months (ranging from 6 to 48 months). The mean duration of diabetes in the study group was 64 months (ranging from 42 to 96 months). The ulcers varied in size from 5.4 to 24 cm2. Inclusion criteria encompassed good glycemic control and a positive Tinel sign. Before the surgical intervention, sensory symptoms were assessed using the Michigan Neuropathy Screening Instrument (MNSI). Doppler ultrasonography of the posterior tibial artery was used to assess blood flow. The surgical procedure involved decompression of the tibial nerve within the four medial ankle tunnels, known as "Dellon Decompression." At 6- to 9-month follow-up: blood flow, MNSI scores, and ulcer diameter/healing progress were evaluated. Pre- and post-operative measurements from the same subjects were compared, with values from decompressed legs being matched with those from control legs.

Results: MNSI scores, indicative of neuropathy symptoms, demonstrated a significant decrease from a mean score of 12.5 pre-operatively to 7.7 post-operatively ($p<0.0001$). All patients reported qualitative improvements in sensation measured using Semmes-Weinstein monofilaments. Blood flow, as assessed through Doppler ultrasonography of the posterior tibial artery, showed a significant increase from 1.52 to 2.46 cm3/sec following decompression of the tibial nerve ($p<0.0001$). At the 9-month follow-up, complete ulcer healing was observed in 66.8% of patients, while a reduction in ulcer size was noted in 33.2% of cases. Notably, there were no incidences of post-operative wound infections or the development of new ulcers.

Conclusion: Decompressing the sympathetic fibers within the tibial nerve at the ankle holds the potential to enhance blood flow in patients with diabetic neuropathy accompanied by chronic nerve compression. Furthermore, decompression of the tibial nerve and its branches in individuals with diabetic neuropathy promotes improved healing of diabetic foot ulcers.

Keywords: tarsal tunnel decompresion, tibial nerve, DFU, diabetic neuropathy

047 THE USE OF CONTRALATERAL C7 ROOT IN BRACHIAL PLEXUS SURGERY

Alain Gilbert

Anatomy Of The C7 Root

C7 comes out between the C6 and C7 vertebras and forms usually the Middle trunk of the Brachial Plexus. There are various variations (pre or postfixed plexus)

It divides in an anterior branch which will be part of the lateral cord and a very important posterior branch, part of the posterior cord.

What Is The Function Of C7 ?

- Muscles: C7 gives part of the innervation to many muscles but never exclusively. The most important are Pectoralis Major, Triceps, ECRB and ECRL.

- Sensation: The classical descriptions show a predominance of C7 in the dorsal sensory innervation of 2nd and 3rd fingers. We shall see that the clinical experience differs from these descriptions.

-The Consequences Of Interrupting C7

Some articles speak of severe complications like Vertebral artery lesion. In my experience: 18 adults and 22 children, a few mild complications have been noted immediately post operation (thumb index dysesthesias in adults, weakening of Pectoralis Major and Triceps) that have disappeared except one in 3 months.

No permanent paralysis has been noted.

Technique And Results

The use of C7 root as a donor was proposed by GU in 1992 and published by many authors since

.These authors have used either the complete C7 root (ZOU, 2010) or partial (WAIKAKUL, 1999;SONGCHAROEN, 2001)

The use of the pre-spinal route allows to shorten the defect between the root and the target and in several cases, it is possible to make a direct suture with the lower trunk

This technique, popularized by WANG may in some cases be improved by a 4 to 6 cm shortening of the humerus. In our experience, it is almost always possible to obtain a direct suture in an adult patient without this shortening.

The success rate of these direct sutures was published by WANG (2014) who obtains 66% of good results on the fingers flexors. This operation is probably the only possibility in in some indications.

In children, and especially in the newborn, it has never been possible to obtain a direct suture. In those cases, the use of allografts allows a good junction.

The indications in early and late cases are discussed.

048 NERVE TRANSFERS IN NON TRAUMATIC AMYOTROPHY IN CHILDREN

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Nerve transfers are rather well known in particular cases of nerve trauma, both in children and adults. They are also usefull in specific conditions affecting children since birth or in early years, like arthrogryposis and flaccid myelitis, rare conditions with often severe motor impairment.We present the rationale for using nerve transfers in those conditions, clinical examples and so far available results.

The indications for selective motor and sensitive nerve transfers are expanding and we discuss actual knowledge and further possible achievements.

Keywords: amyotrophy; nerve transfer; arthrogryposis; myelitis

049 THE PIRIFORMIS SYNDROME MANIFESTING AS A LUMBAR DISC SYNDROME. A 25 YEAR EXPERIENCE IN TREATING PATIENTS WITH PIRIFORMIS SYNDROME. A REPORT OF 19 CASES

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The Piriformis syndrome is an uncommon compressive sciatic neuropathic caused by fibrosis of the Piriformis muscle. Trauma seems to be the dominant culprit in the etiology of fibrosis or muscle spasm of the Piriformis muscle. Based on the proximity of the Piriformis muscle of the sciatic nerve, it can cause compression, friction fibrosis, and adhesions of the sciatic nerve leading to pain, weakness and numbness sensation in the sciatic nerve distribution. The diagnosis of Piriformis syndrome is a diagnosis of exclusion. It is essential to rule out any other pathological processes involving the nerve roots and the sciatic nerve by itself. When the neurodiagnostic testing provides no objective answer for the patient's leg pain, weakness and numbness sensation, then the diagnosis of a piriformis syndrome plays an important role in the understanding of the sciatic pain and options for treatment.

The most consistent finding on physical examination was the presence of Tinel's sign at the sciatic notch. MRI of the lumbo-sacral spine was unremarkable even in those with a previous lumbar discectomy. Electrical studies demonstrated acute and or chronic denervation in the L5- S1 territory in 8 patients. In 7 patients the nerve conduction velocity (NCV) and "H" or "F" wave studies showed reduced electrical conduction of the sciatic nerve at the sciatic notch. In 4 patients EMG and NCV studies were nondiagnostic.

19 patients underwent surgery after failing medical treatment including piriformis muscle injections over a period ranging from 1 to 20 years. At surgery, fibrosis of the piriformis muscle causing compression of the sciatic nerve was found in all cases. In 4 patients additional scar tissue in the epineurium of the sciatic nerve was removed. The pathological examination was consistent with muscle fibrosis and chronic inflammation.

The most dramatic improvement was noted in patients with a bifid piriformis muscle. Eleven patients had complete recovery with a period of 3 months and returned to work without restrictions. Six patients regained strength but continued to have mild to moderate pain. The other 2 patients presented with chronic pain and did not benefit from surgery. A successful surgery was commonly related to the lack of scar tissue around the sciatic nerve and the finding of clinical muscle weakness in addition to a complaint of leg pain.

The surgical treatment of patients with a piriformis syndrome has been a controversial area in surgery. In patients with piriformis syndrome, a favorable outcome resulted with a medical management such as local piriformis injections and physical therapy. However, in selected patients, an operative alternative is simple, safe and effective for the treatment of a piriformis syndrome in patients that have become refractory to medical treatment.

I have treated patients with piriformis syndrome for over 25 years, and I came to the conclusion, that lower extremity compressive neuropathies are more difficult to document, and more common that people think and usually forgotten and overlooked. I have found that the medical community is more prone to treat a compressive neuropathy affecting the upper extremity that have been refractory to medical treatment with surgery and not the lower extremity, however, state of the art ultrasonography and MR neurography appears to be helpful in the diagnosis of piriformis syndrome.

Keywords: piriformis syndrome, sciatic neuropathy, decompressive surgery 202

050 110 YEARS OF RADIAL NERVE TRANSFER TO THE AXILLARY NERVE

Dr. Jorge F. Clifton Correa

In 1911 Adolf Stoffel describe in the book¨Orthopadische Operationslehre¨, a surgical procedure where in an anterior axillary approach, he takes a segment of the radial nerve and sutured inside the axillary nerve, there is no report of the results. After WW II in 1948 Lurje A. published a case where he did the Stoffel procedure to a young patient with good result.

In 2003 Somsak Leechavengvongs published a posterior approach, where he takes the radial nerve branch to the long head of the triceps and sutured to the anterior division of the axillary nerve, with good shoulder abduction. In 2004 Jaime Bertelli published a posterior approach and recommended to include the branch of the Teres Minor to the anterior division and both be reinnervated to the branch of the long head of the triceps, to improve the shoulder external rotation, He published in 2007 the same transfer to an anterior axillary approach.

Radial nerve branch from the triceps to the Axillary nerve has evolved to include the branch of the Teres minor and improves shoulder function not only abduction but also external rotation.

051 COMBINED VASCULAR INJURIES AND PERIPHERAL NERVES TRAUMA

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Neurovascular trauma is a growing surgical chalenge! Important lesssions on penetrant injuiries are learned during war time, procceding with civilian trauma (criminal) and culminated with traffic injuries focused on blind trauma! Finaly picture is completed with jatrogenic injuries during diagnostic and interventional radiological and surgical proccedures.

Vascular trauma refers to penetrant extremity injury, and due to close position, peripheral nerves are affected. Sharp stub wound in vessel projectory or blunt trauma with closed bone fracture and luxation could decive! The degree of tissue damage is a feature of energy transfer. The available kinetic energy of a missile is determined by its mass and velocity! Pulsating of the temporary cavity and the shock waves induced by a high-energy missile striking an extremity may indirectly injure the peripheral nerves and vessels, even though the projectile did not directly hit them.

Key role in proper solving vessel injuries is shortening the time between injury and definitive care: bleeding control, prompt diagnostic investigation, resusitation, fast and proper revascularisation with adequate tretament of fractured bones and injured peripheral nerves!

Postponed nerves repair comes along with a nature of penetrant injuries as a dominant profile. Sharp injuries permits primary neurosurgical repair! Neglected injuries rate is more frequent than expected! Repaired nerves revascularisation remains unclear whether an optimal recipient bed or immediate vascularization ("vascularized grafts") is beneficial to functional result in nerve grafting.

A small-caliber grafts revascularize rapidly and do not depend on the surrounding tissue as an initial source of neuro vascularization but are rather supplied by longitudinal inosculation. Iinsertion of long vein grafts results in damaged or insufficient inosculation at the ends of a divided nerve because of impairment of nerve nutrient vessels at the site of injury. Centripetal neovascularization is also compromised because of the scarred, often "avascular", surrounding tissue bed, common in secondary reconstruction of war injuries.

This leads to conclusion: optimal extremity recovery is linked to both vessel and peripheral nerve repair!

Keywords: neurovascular trauma, penetrant injury, tissue damage, revascularization, nerve repair, neovascularisation

052 INDICATIONS FOR PERIPHERAL NERVE SURGERY

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Introduction: Nerve compression syndromes can lead to a pinched nerve and neuropathy. Acute nerve lesion is mostly consequence of stretch-related injury, laceration and compression injury. After 24 months of denervation, most muscles cannot recover useful function even with reinnervation. Selection of patients and timing for surgery are two critical factors in the management of peripheral nerve lesions.

Patients and methods: This study was done with the aim to anylize clinico-pathological caracteristics, treatment, complications and outcome in patients who undergone peripheral nerve surgery. A retrospective analysis includes 100 consecutive patients who were operated on for 70 compressive neuropathies, 20 peripheral nerve injuries and 10 peripheral nerve tumors. Neurological status, electrophisiology, ultrasound and radiological MRI findings, localization and type of surgery, histopathology, complications and outcome were analyzed.

Results: Carpal tunnel syndrome was the most entrapment neuropathy indicated for surgery. Radial and sciatica nerve injury were the most common peripheral nerve lesions for surgery. The most common peripheral nerve tumors were located on sciatic and ulnar nerve. The average age of patients with compressive syndromes was 55 years, 45 women and 25 men. Among patients operated on for peripheral nerve injury, there were 13 men and 7 women with average age of 24 years. Peripheral nerve tumor was present in 6 women and 4 men with an average age of 31 years.

Conclusion: Decompression of entrapment neuropathy is indicated in case of unsuccessful conservative treatment. Longer distance from the injury site to the functional unit to be reinnervated, the earlier surgical intervention should be considered. Gross total resection with preservation of neurological function is the ultimate goal of peripheral nerve tumor surgery.

Keywords: peripheral nerve, entrapment, injury, tumors, surgery

053 TOWARDS A NEW UNDERSTANDING OF CSF CIRCULATION

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For more than a century the physiopathogenic interpretation of hydrocephalus was based on the concepts propounded by Dandy and Blackfan in 1914. Basically, the hydrocephalus was thought to occur in case of an obstacle to the CSF circulation from the sites of its production by the choroid plexuses within the ventricular system to the sites of its absorption into the venous system in the subarachnoid spaces of the cerebral convexities. According to such an hypothesis, bases on the movement of dyes injected into the cerebral ventricles, the CSF would move within a specific spaces delimited by membranes impermeable to water. The hypothesis offered an easy explanation apparently supported by the clinical experience of ventricular dilation following the tumoral obstruction of the main CSF pathways or inflammatory processes involving the meninges. Furthermore, it offered a rational base for the surgical treatment based on surgical CSF diversion. Actually, the surgical successes in the treatment of a condition priorly considered to be incurable could have a role in obscuring the criticisms that where arisen in the same years that discarded the possibility of CSF being absorbed in the peripheral subarachnoid spaces, being the arachnoid membrane devoid of capillaries or the failures of plexectomies aimed at blocking the CSF production.

The advent of modern diagnostic tools has challenged the Dandy and Blackfan paradigm demonstrating the free movement of water in both direction through the supposed impermeable ventricular ependyma or the CSF pulsatile movements into the ventricular system rather than into the subarachnoid spaces in patients with obstructive hydrocephalus undergoing endoscopic ventriculostomy. In recent years, a series of experimental observations has demonstrated the continuous exchanges and of cerebral fluid (interstitial fluid) and the fluid contained within the ventricular system and their substantial identity. On the these grounds a more complex network of anatomo-functional structures regulating the fluid movements within the CNS has been recognized, the so-called glymphatic system, that challenged the traditional concept of unidirectional CSF movements (CSF circulation) in favor of a wide and disuse fluid displacement responding to focal osmotic and pressure factors. The just individuated fourth meningeal membrane, acting as a mesothelium, that compartmentalizes the subarachnoid space, defined subarachnoid lymphatic-like membrane (SLYM) has further contributed to our understanding of the CSF dynamics.

054 AI IN NEUROSURGERY - WHERE WE ARE GOING?

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Purpose: Clinical decisions on Stereotactic Radiosurgery (SRS), an indication for the treatment of brain tumors and metastases, are based on the comparison of the irradiated lesions sizes in the pre (baseline) and post (follow-up) treatment T1 MRI scans. The aim of this study was to evaluate the performance of SimU-Net, a novel deep learning method for the automatic volumetric analysis of brain metastases and their changes on pairs of baseline and follow-up brain scans.

Methods : The SimU-Net pipeline was used for the detection of brain metastases and their temporal changes in pairs of MRI scans. SimU-Net is a simultaneous multi-channel 3D U-Net model trained on pairs of registered scans of a patient. It matches the lesions and classifies the lesion changes on both scans. A dataset of 231 pairs of MRI scans from 193 patients who underwent SRS at the Hadassah University Medical Center were retrospectively collected. An expert neurosurgeon manually delineated a total of 1, 731 metastases (640 baseline, 837 follow-up) in the MRI scans using the ITK-Snap software. The number of brain metastases with diameters 0-5mm, 5-10mm and > 10mm was 223, 577, and 931, respectively. The deep learning model was trained, validated and tested with 205 pairs (1, 477 metastases), 7 pairs (52 metastases), and 19 pairs (131 metastases). The computed test set results were then compared to their respective ground truth delineations and the lesion matchings.

Results: SimU-Net achieves a mean brain metastases detection Precision (aka specificity) and Recall (sensitivity) and std for brain metastases with diameters >10mm of 1.00±0.00 and 0.97±0.11, > 5mm of 0.88±0.30 and 0.87±0.20 and 0.77±0.30 and 0.85±0.23 for all sizes. The metastases segmentation Dice scores are 0.89±0.08, 0.88±0.06 and 0.86±0.09 for the same metastases sizes, all above the observer variability of 0.80±0.13.

Conclusion: Simultaneous deep learning classification of post-treatment SRS lesions in T1 MRI scans with SimU-Net achieves results that are at least as good as the observer variability.

Keywords: stereotactic radiosurgery evaluation; brain metastases detection and segmentation; volumetric brain metastases assessment; longitudinal evaluation

055 NEUROREGENERATION IN 2040: WILL STEM CELLS, EXTRACELLULAR VESICLES, AND NANOTECHNIQUES DELIVER THEIR PROMISE?

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Introduction: For half a century, stem cells (SCs) have offered hope for neuroregeneration in disorders ranging from brain and spinal cord injury to stroke and Parkinson's disease. Various SCs and various administration techniques (intravenous, intrathecal, direct tissue injection) have all failed to deliver significant results. Why should hope for 2040 be greater than previously?

Methods: Over the past decade in particular, several advances offer some reason for hope. In addition to advances in understanding SC survival and function as "neuroregenerators", the importance of extracellular vesicles (EVs) for cell-to-cell communication has been understood – and how to manufacture effective EVs has been made clear. EVs can serve as protective transport mechanisms for proteins and other essential moieties that otherwise would be degraded before reaching their destination. Nanotechniques such as nanoparticles (NPs), hydrogels, and nanoscaffolds that can act as "guides" to assist stem cell "products" in reaching their proper destination are another area where our understanding has advanced dramatically in the past decade. Additionally, microneedle "patches" – both external (skin) and at the site of nervous system injury – can provide sustained release of the "neuroregenerators".

Results: The COVID pandemic spawned the mRNA vaccine, which is a < 100 nm diameter lipid NP containing the mRNA "effector" in an EV that allows the mRNA to be transported to the target cell without degradation. Variations on this model have been employed to enhance SC efficacy for neuroregeneration in animal models in recent years – particularly in brain and spinal cord injury models.

The neuroregenerative potentials for SCs are several: optimizing the neuroinflammatory response to injury, enhancing the effects of neurotrophic factors, providing proteins and other moieties needed for repair. The benefits of each of these techniques in neuroregeneration are described using examples from the recent literature. The progress in treatment for spinal cord injury in particular (but also brain injury/stroke and neurodegenerative diseases) because of the advances over the past decade is presented from the rapidly increasing research literature.

Conclusions: The disappointing results of human studies from the 1980s to the 2010s employing SCs for spinal cord injury and Parkinson's disease suffered from a lack of knowledge of the complexity involved. Recent laboratory studies have enhanced our understanding of the many facets to SC-based neuroregeneration. It is likely that by 2040 we will have SC-based neuroregenerative treatments that are ready for "prime time" in humans.

Keywords: extracellular vesicles; nanoparticles; nervous system injury; neuroregeneration; stem cells

056 NON-INVASIVE PULSED ELECTRICAL FIELDS FOR INDUCING SUBTLE/TRANSIENT BBB DISRUPTION, ENABLING EFFICIENT DELIVERY OF THERAPEUTICS INTO THE CNS

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Poor penetration of therapeutics across the blood-brain barrier (BBB) is a major challenge in treating brain diseases. We have developed a method to induce transient/safe BBB disruption (BBBd) by applying a short non-invasive treatment of low pulsed electric fields (L-PEFs). L-PEFs (6-100 sec, 0.005% on) were applied to mice brains using two plate electrodes pressed against the skull. BBBd was depicted and quantified using MRI-based treatment response assessment maps (TRAMs): multiple delayed-contrast T1-MRIs were co-registered to the first scan and pixel-by-pixel fits to a bi-exponential function were used to determine volume/intensity of BBBd regions. The TRAMs correlation with a numerical simulation of the electric fields distribution was studied. Doxorubicin (580Da), Albumin-Evans blue dye (70KDa) and IgG (150KDa) were used to study drug penetration into the brain.

BBBd induced by L-PEFs was depicted in the TRAMs but not in conventional T1-Gd. BBBd intensity/volume increased linearly with the voltage and number of pulses. Based on the simulations, the electric fields in the disrupted volume were only 28-65 V/cm. Full BBB recovery occurred after 1-4 hours depending on treatment parameters. No signs of damage were observed in the treated brains and the mice showed no neurological deficits post L-PEFs. The TRAMs results were consistent with the Evens-Blue results, showing areas BBBd mainly in the cortex of treated animals. IgG showed extravasation in treated brains but not in sham. Doxorubicin concentration in treated brains 4 hours post L-PEFs was 885±85 μM which is X230 its IC50 in GL261 glioma cells.

These results demonstrate the feasibility of applying short L-PEFs treatments for non-invasive/ transient BBBd, enabling efficient delivery of small/large molecules into mice brains. Our simulation results demonstrate the feasibility of extending to human brain size, thus leading the way to new means for non-invasive drug delivery into the CNS.

Keywords: Pulsed electric fields, bbb, brain, drug delivery

057 EMERGING TECHNOLOGIES AND INNOVATIONS IN NEUROSURGERY

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Neurosurgery has always been a high-tech specialty. The implementation of new tools has defined whole branches and eras in neurosurgery as it was with micro-neurosurgery, endoscopic, stereotactic and endovascular neurosurgery etc.

For the last decade the digital revolution brought in our everyday vocabulary words as robotization, telemedicine, big data, artificial intelligence (AI), virtual (VR) and augmented reality, 3D printing. The modern neurosurgeon is exposed to huge amount of nonmedical, nonsurgical information and knowledge that will strongly influence the future of our specialty.

With this presentation we try to foresee how these new technologies are changing our neurosurgical practice, how they will shape our tomorrow and how we, neurosurgeons to stay at the upfront and remain leaders in the creative process of development of new devices and technologies.

Keywords: Innovation; new technologies

058 AUGMENTED REALITY IN SKULL BASE SURGERY

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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. All patients who underwent surgery for resection of acoustic neurinomas as well as other schwannomas of the pontocerebellar angle, and skull base meningiomas at our Department were included in the study. Clinical outcome in terms ofnpostoperative neurological deficits and complications

was evaluated, as well as neuroradiological outcome for tumor remnants and recurrence.14 consecutive patients who underwent resection of acoustic neurinoma via retrosigmoid osteoclastic craniotomy with use of intraoperative neuromonitoring by single surgeon were included in the study.

Resection was performed using fiducial-based navigation and microscope-based AR, all in sitting position. Segmented objects of interest in AR were sigmoid and transverse sinus, tumor outline, cranial nerves VII and V (CN V) and brain stem. 39 patients who underwent surgery for skull base meningiomas using intraoperative computer tomography-based automatic registration and microscope-based augmented reality were included in this evaluation. AR facilitated orientation in the resection of skull base meningiomas with encasement of cerebral vessels and compression of the optic chiasm, as well as in reoperations, increasing surgeon comfort. No injuries to critical neurovascular structures occurred. Use of AR improved orientation in the operative field for craniotomy planning and microsurgical resection by identification of important neurovascular structures, identification of important anatomical relations to venous sinuses, petrous vein and course of cranial nerves.

Keywords: augmented reality, skull base surgery, neurooncology

059 PUTTING NEUROTRAUMA ON THE MAP : MAKING IT A NOTIFIABLE CONDITION

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Although it is well known that Neurotrauma is one of the biggest cause of death and disability especially in Lower and Middle income countries, yet the true burden of Neurotrauma, both brain and spine is not really known.

The previous efforts by the special Lancet Commission report on Traumatic Brain Injuries was a crucial milestone in global advocacy. Also the Comprehensive Policy Recommendations on Brain and Spine Injuries (Peshawar Recommendations) from Harvard School of medicine, program in Global surgery and Social change (PGSSC)and Northwest School of Medicine, Peshawar has laid the foundation for advocating Neurotrauma as a notifiable condition .

By making Neurotrauma a notifiable condition we can improve surveillance , early detection and intervention, resource allocation, and policy development , which can ultimately improve outcome.

Keywords: Neurotrauma ; notifiable condition ; advocacy ; improve outcomes

060 CONTEMPORARY MANAGEMENT OF CHRONIC SUBDURAL HEMATOMA AND A POTENTIAL FOR IMPROVEMENT

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Introduction. Chronic subdural hematoma (CSDH) is one of the most prevalent neurosurgical entities. Considering the recent findings of their pathophysiology is crucial in understanding of modern treatment principles. The epidemiology reveals an increasing incidence, particularly in older age groups, it is anticipated to double by 2040, and age alone should not be a deterrent to surgery.

Surgical outcomes of CSDH treatmnet indicate recurrence rates ranging from 8-30%, complications from 0-25%, and surgical mortality up to 10% leaving a vast space for improvement, yet, the existing evidence provides clear recommendations for the limited number of domains. Management of CSDH. Patient referal to surgery hinges on clinical symptoms, with no consensus on radiological cut-off parameters.

The choice of anesthesia presented a dilemma - local or general? But, Class I evidence supports the superiority of local anesthesia.

In the realm of surgical techniques, the main outcome is reoccurrence, and the choice between burr-hole (BHC), twist-drill craniostomy (TDC), or craniotomy is pivotal. Class I evidence leans towards BHC, showcasing a trend towards lower reoperation rates.

Pneumocephalus was previously identified as a significant precursor of reoccurrence, therefore prevention of this occurrence gained significant attention and a variety of solutions. When it comes to irrigation, the evidence favors body warm (37°C) over room temperature (25°C) irrigation for reducing recurrence.

Closed drainage for 48 hours emerges as a strong recommendation, significantly reducing recurrence and 6-month mortality. However, studies have failed to reduce this time to 24 hours. The type of drainage, specifically subdural versus subgaleal, demonstrates significant differences in recurrences and complications.

The aspect of bed rest takes an interesting turn, with early mobilization being favored for reducing complications without affecting recurrence rates. Routine CT control, however, receives a cautious note, with Class I evidence discouraging it due to potential increased re-operation without improved outcomes.

Adjunct and treatment options aimed at replacing surgery are on the rise, but still unmatching surgery. These include: pharmacological interventions (atorvastatin, tranexamic acid, steroids) which lack robust evidence, and with a variety of application options complicating things even more; and middle meningeal artery embolization, a promising but still evolving technique, with a plethora of ongoing randomized controlled trials (RCTs) underway.

Conclusion. CSDH poses an everyday neurosurgical challenge. While the evidence base for surgical management is improving, a critical need for more research and standardized outcome reporting remains. Ongoing and further studies are imperative to refine and establish optimal practices in the management of CSDH.

Keywords: chronic subdural hematoma, evidence-based medicine, surgical technique

061 THE IMPACT OF SIMULTANEOUS TRAUMA TO THE BRAIN AND TO THE SPINE

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Objective: While individually traumatic brain injury (TBI) and traumatic spinal injury (TSI) have been studied extensively, the impact of the simultaneous TBI and TSI on on outcomes is relatively unexplored and can be of importance for the management and prognosis of patients with these concomitant lesions.

Methods: Retrospective data from the TraumaRegister DGU® were collected between 2011 and 2020 and used to evaluate all registered trauma victims in Germany who suffered a relevant TBI (AIS 3 or more; group TBI) or a relevant TSI (AIS 3 or more; group SI), as well as those who suffered both (both AIS 3 or more, group TBI-TSI). Patients who suffered other relevant body part lesions (AIS 3 or more) were excluded.

Results: A total of 190, 820 complete datasets for victims of AIS trauma of 3 or more were available. After exclusion of 137, 162 patients with trauma to other body parts, we identified 53, 658 patients who suffered either relevant TBI (44, 442; 85.1%), relevant TSI (7, 989), or both TBI and TSI (1.227). The table and diagrams show results of the analysis with respect to patient demographics, trauma aetiolgy, surgery carried out for head or spine, surrogate outcome parameters (Glasgow outcome scale, referral to rehabilitation, death), etc.

Conclusion: Concomitant TBI and TSI leads to a worse clinical state on arrival (GCS, ISS, intensive care stay). The severity of the combined lesions is slightly lower than for TBI or TSI (AIS). The cervical level of the spine is most affected by the combination. Concomitant injury increased both the morbidity (length of hospital stay, patients requiring rehabilitation or transfer to other hospital) and early mortality (mortality in hospital) .

Keywords: traumatic brain injury (TBI); traumatic spinal injury; spinal cord injury; concomitant craniospinal trauma; outcomes

062 MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY- RESULTS AND REFINEMENT OF THE LUND CONCEPT

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Management of severe traumatic brain injury (TBI) is highly complex. In addition, protocol- driven treatments of intracranial (ICP) and cerebral perfusion (CPP) pressures vary among centers worldwide. The Lund concept was introduced more than 25 years ago as a then controversial alternative to the use of high-dose vasopressors aiming at increasing blood pressure to achieve sufficient perfusion of the brain (by increasing CPP). Instead, the Lund concept1 is based on the argument that a high CPP lead to increased hydrostatic capillary pressure with transcapillary filtration and aggravation of vasogenic brain edema due to an open blood-brain barrier.

The basis of the Lund Concept is thus normalisation of the commonly raised arterial blood pressure by beta-blockers and alfa2-agonist (most often clonidine). Moreover, colloidosmotic pressures are increased by isotonic 20% albumin infusions, liberal transfusion thresholds are used and high serum sodium levels up to 155 mmol/L are accepted. A CPP down to 50-55 mmHg is tolerated for adults, even lower in the pediatric population. Per protocol, ICP monitors are placed in combination with brain tissue oxygen monitors (pBTiO2) in every severe TBI case. While vasopressors were initially to be avoided, to date in particular nor-epinephrine is used. Retrospectively, we have analyzed 10-year results of severe TBI in the pediatric2 and adult setting (ongoing analysis). A total of 171 adult patients have been identified, all treated with the Lund Concept, and mortality and functional outcome will be presented at the meeting. We also analyzed 86 severe pediatric TBI patients <18 years of age admitted to our neuro-critical care unit (NICU) and treated with the Lund Concept2. Mortality in NICU was 10% and 6-months outcome was good in 60%, moderate in 25%, and unfavorable in 15 with none in a vegetative status. In both dichotomized and ordinal analyses, CPP <40mm Hg and ICP >15 mmHg were associated with poor outcome. However, high CPP also was also associated with increased mortality and morbidity, supporting that elevated CPP might increase cerebral edema.

While autoregulatory status is increasingly used to guide CPP, the Lund concept has a remaining role in view of its potential to attenuate brain edema in severe TBI by allowing a relatively lower CPP than in many other NICUs. As with all NICU protocols there has been important modifications also to the Lund Concept, and its development- and refinement- over recent years will be discussed at the presentation.

Keywords: Traumatic brain injury; intracranial pressure; cerebral perfusion pressure; Lund concept

063 TRAUMATIC BRAIN INJURY UNDER ANTITHROMBOTIC THERAPY

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Background: All available recommendations about the management of antithrombotic therapies (ATs) in patients who experienced traumatic brain injury (TBI) are mainly based on expert opinion because of the lack of strength in the available evidence-based medicine. Currently, the withdrawal and the resumption of AT in these patients is empirical, widely variable, and based on the individual assessment of the attending physician. The main difficulty is to balance the thrombotic and hemorrhagic risks to improve patient outcome.

Methods: The author presents a non systematic review about the different issues related to the patients who experienced TBI under ATs, such as optimal timing of venous thromboprophylaxis, indication of tranexamic acid, evaluation independent predictors for favorable discharge under DOAC, antiplatelet therapy to prevent perioperative bleeding, stop and re-uptake of anticoagulant therapy.

Moreover the author reporta a recent published Intersociety Consensus Document, with a proposal of a table for thrombotic and bleeding risk evalutation, with a dichotomization in high risk and low risk, matching different isolated TBI (iTBI) scenarios.

Results: A flow-chart decision for these complex mechanis, for complex scenarios should take in consideration patients with coagulopaty, patients will develop post-traumatic coagulopaty, patients needs prophilaxys. The published document proposed a total of 28 statements encompassing the most common clinical scenarios about the withdrawal of antiplatelets, vitamin K antagonists, and direct oral anticoagulants in patients who experienced blunt iTBI.

Conclusions: no guidelines have specifically focused on patients with neurotrauma, and therefore the management of AT in these patients is empirical and widely variable, reflecting the challenging balance between thromboembolic and bleeding risk as assessed by the attending physician. The initial establishment of a thrombotic and/or bleeding risk scoring system can provide a vital theoretical basis for the evaluation of effective management in individuals under AT who sustained an iTBI. The published intersocietary document can be implemented into local protocols. Overall, the panel reached an agreement for 20 of 28 (71%) questions, deeming 11 of 28 (39%) as appropriate and 9 of 28 (32%) as inappropriateinterventions. The appropriateness of intervention was rated as uncertain for 8 of 28 (28%) questions.

Keywords: Anticoagulant, Antiplatelet, Consensus, DOAC, Hemorrhage progression, Reversal strategy, Traumatic brain injury, Thrombotic risk

064 THE UTILITY OF BIOMARKERS IN TRAUMATIC BRAIN INJURIES IN CHILDREN: OPPORTUNITIES AND CHALLENGES

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Worldwide, traumatic brain injury (TBI) is a major health problem resulting in approximately 70 million deaths per year. However, this alarming statistic alone does not reflect the full extent of this disease. The morbidity among TBI survivors is wide-ranging and exerts a tremendous burden on public health services in all countries.

Although no age group is immune from TBI, the extremes of age are most vulnerable. The highest frequency of hospital admissions occurs among the elderly(age > 65 years) closely followed by pediatrics (< 21 years). Although children and adolescents have an overall lower mortality than adults (approximately 5% of all TBI related deaths), the burden of the disease is more substantial when measured as years of life lost and years lived with disability. Pediatric TBI also has widespread consequences for family, community, overall healthcare system, as well as the health of future generations.

In both adult and pediatric TBI populations, management based on clinical (Glasgow Coma Score) and radiographic findings (head CT) alone is unreliable. Blood biomarkers hold promise of allowing better prognostication, refining real time management decisions such as need for head CT, transfer to a higher-level trauma center, and direct and monitor treatments.

The utilization of TBI biomarkers in adults has been extensively researched and adapted within clinical settings. Blood-based biomarkers, notably S100B and GFAP, have already been incorporated into TBI guidelines in adults. Despite the high incidence and long-term consequences of pediatric TBI, research in this population is lacking. Adults have been the focus of most research efforts. Given the differences in physiology and pathophysiology between children and adults, and the differences in sequelae following TBI, not all research inferences identified in adult TBI patients can be applied to children.

TBI biomarker investigation in children has unique challenges. Firstly, the collection of samples poses a considerable challenge due to limitations with blood samples volume. With only a restricted amount of blood, typically 1.7mL/Kg/Day, available for clinical purposes, obtaining additional blood for research related assays become inherently difficult. Second, age-specific normal values for commonly known TBI biomarkers are not well established for different stages of neurodevelopment. This is particularly true in infants where there is rapid and continued ontogenetic brain maturation. Children undergo continuous structural and biochemical changes during their growth and brain maturation, likely leading to distinct TBI.

Keywords: Brain; trauma; biomarker; pediatrics; children

065 CONTROVERSIES OF CURRENT SURGICAL TREATMENT OF MISSILE PENETRATING BRAIN INJURY DURING THE MILITARY CONFLICT

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Introduction: Missile penetrating brain injury implies traumatic mutilation to the scalp, the cranial vault/base, the brain coverings, brain tissue/ parenchyma, and or cerebral ventricles. It is inflicted by projectiles of different masses and velocities, making it a complex and highly contaminated injury, which penetrates the dura. Under military conflict circumstances, such an injury is always life-threatening, predisposing the wounded to multiple complications, including infection and seizures. Its current management should be aimed at rapid evacuation from the war zone, swift and appropriate diagnostics, and early and effective surgery to improve the outcome and diminish morbidity/ mortality. This review addresses some controversies of war missile penetrating brain injury current management, which still exist despite the most modern surgical principles applied.

Methods: It is based on the personal case series experience of regular neurosurgical practice gained under extreme military conflict conditions during the 1991 – 1995 war in Croatia. Results and Discussion: The time interval between injury and hospital admission is a crucial aspect influencing the outcome, offering a better prognosis if short, but also uncovering moribund patients with no chance of survival. The best surgical strategy for such an injury is still contentious: a craniotomy with debris debridement and watertight dural closure, or decompressive craniectomy without duraplasty. Extensive removal of devitalized brain tissue and intracranially retained bullets/shells, metal, and bone fragments should be avoided.

Conclusion: Aggressive resuscitation and immediate evacuation to the nearest neurosurgical facility remain a precondition of management success where antibiotic prophylaxis, urgent CT diagnostics, and early adequate cranial surgery offer a rational likelihood of survival and recovery. The in-depth extraction of intracranially retained fragments is not recommended since no association between their presence and the development of either an infection or a seizure disorder is not recognized.

Keywords: Missile penetrating brain injury; Military conflict; Management

066 ENDOVASCULAR EMBOLIZATION TREATMENT RUPTURED ANEURYSMS 16 YEARS FOLOW/UP

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Background: Endovascular embolization of ruptured intracranial arterial aneurysm has become the first treatment choice due to its minimal invasiveness, rapid recovery of the patients, and low complication rate.

Objective: The aim of this study was to analyze putative risk factors of unfavorable outcome of ruptured intracranial aneurysms after coil embolization.

Methods: The case series included adult patients with ruptured intracranial aneurysm who were subjected to endovascular embolization of a during the study period 2007-2023. Primary study outcome was the Hunt & Hess Grade 3 weeks after the endovascular embolization.

Results: In total 1080 patients with ruptured intracranial aneurysms treated by endovascular coiling participated in the study. Initially, complete endovascular embolization of ruptured aneurysm was achieved in 986 patients (91.3%), partially complete in 54 (5.0%) and incomplete in 40 patients (3.7%). During the first 3-6 months after initial intervention, repeated embolization was performed in 62 patients (5.7%) and 40 patients (3.7%) died during the first year.

Conclusion: Endovascular embolization of ruptured intracranial aneurysms is effective, minimally invasive method, which enables high survival rate of patients without permanent neurological deficit.

Keywords: intracranial aneurysms; subarachnoid hemorrhage; endovascular embolization; treatment outcome

067 ROLE OF INFLAMMATORY AND OXIDATIVE STRESS MAKERS IN INTRACEREBRAL HEMORRHAGE: OUR EXPERIENCE IN PREDICTING POSTHEMORRHAGIC CEREBRAL EDEMA

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Introduction. In our clinical and scientific work, we detailly evaluated the applicability of nineteen inflammatory and five oxidative stress (OS) mediators as candidates for prognostic biomarkers in the prediction of the edema volume, which develops 5 days after intracerebral hemorrhage (ICH) and can lead to severe deterioration.

Material and methods. We performed prospective, longitudinal cohort study in the period from March 2019 to May 2020, focused on conservatively treated non-comatose patients with acute, primary, supratentorial ICH, without hematoma expansion or intraventricular bleeding during the disease course, which were followed from admission to their hospital discharge. In this study we focus on examination of the possible benefits from machine learning based on the previously detected biomarker profiles and interactions. Several software packages were used for mathematical modeling with direct 3D visualization of the edema formation, as well as a number of shockwave flash applications with interactive 3D plots, which together were able to reveal preliminary new insights and patterns of interactions among the biomolecules.

Results. Seventy-three (73) patients have completed the study and were included in the statistical analyses. The cohort group of 73 patients was characterized by predominantly male participants (63%), with a mean age of 71 years and mean admission CSS score of 5.4. The main etiology for ICH was diagnosed hypertension (78.1%). Most of the patients had deep ICH, predominantly in the left hemisphere. In-hospital mortality rate was 28.8%. The variables age, AMC, CAT, SOD, GPx, MDA, and glucose levels did not correlate significantly with the edema volume. The final model included the moderator CRP _ AOPP as a significant predictor, having higher effect in the overall model, when compared to the effects of the two variables alone.

068 MINIMALLY INVASIVE EVACUATION OF HYPERTENSIVE INTRA CEREBRAL HAEMORRHAGE THROUGH A MINI-CRANIOTOMY IN A RESOURCE-POOR SETTING

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Objective: To analyse the neurological outcomes of patients who underwent minimally invasive evacuation of hypertensive Intracerebral Haemorrhage (ICH) through mini-craniotomy under limited resource setting in a 3rd world country and its' impact on cost effectiveness.

Methodology: This was a retrospective analysis of 144 patients operated by a single surgeon at multiple centres over 4 years from 2019-2022. Out of 164 patients who had undergone the procedure, 144 cases who met inclusion criteria and completed follow up for at least 6 months were included. Inclusion criteria were Supra-Tentorial Thalamic or Basal ganglia ICH in a pre-existing hypertensive patient with presenting GCS of less than 9 and haematoma causing mass effect (at least 5mm midline shift) or; expansion of ICH over time causing mass effect and a corresponding drop in initial GCS to less than 9 in a patient where surgery was not considered initially. Patients on anticoagulants, age more than 65years, massive ICH with poor expected outcome, severe pre-existing multiple co-morbidities, bilateral non-reactive dilated pupils on presentation were excluded from the study. CT Angiography done in suspected cases (48/144) and all were negative. 81 cases operated under General Anaesthesia, 36 under sedation and 27 under Local Anaesthesia. Straight incision of 3-5cm made and a mini-craniotomy of slightly larger than a burr-hole made in all cases. Trans-sulcal or Trans-gyral route selected and ICH evacuated under the microscope.

Results: Study included 99 males and 45 females with a Mean age of 53.43 (range 29-65) Average operative time was 42.12 minutes and average volume of ICH evacuated was 34.45cm3. Tracheostomy done at the same time of ICH evacuation in 40/144 patients, 19 out of which already had features of Aspiration Pneumonia at the time of surgery. Only 79/144 patients were sent to ICU due to shortage of ICU facility and 65 sent to ward directly. 30-day Mortality was 12.5% (18/144) and mortality at 6 months was 16% (23/144)

Average length of ICU stay was 3.41 days while average length of hospital stay was 8.44 days. Rebleeding occurred in 5 cases where 2 died, 2 re-evacuated and 1 conservatively managed. Number of patients developed post op pneumonia and died of Pneumonia were 43/144 (29.8%) and 10/144 respectively (6.9%). Number of patients who showed Modified Rankin Scale (mRS) score of 1 to 3 (favourable prognosis) at 1 month, 3 months and 6 months were 72/144 (50%), 78/144 (54.2%) and 88/144 (61.1%) respectively.

Conclusions: Minimally Invasive evacuation of Hypertensive ICH through open mini-craniotomy is a viable option with low mortality and good neurological outcomes in terms of short ICU and short hospital stays and significant proportion of favourable mRS scores at 6 months. Number of cases who died of Pneumonia were low (6.9%) due to a combination of facts including early tracheostomy. The procedure has relatively short operative time and GA was not required in significant number of cases which contributes to overall cost effectiveness.

Keywords: hypertensive ich; mini-craniotomy; modified rankin scale

069 MAGNETIC RESONANCE IMAGING MARKERS OF DEPRESSION IN THE ELDERLY

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Introduction with aim: Depressive disorder is the most prevalent affective disorder nowdays and is associated with changes in the brain white matter of almost all regions. White matter changes in depressive disorder could be a result of disturbed cerebral blood flow (CBF) and CBF self-regulation, impaired blood-brain barrier function, various inflammatory factors, genes and environmental factors. There is a convergence of scientific facts suggesting a causal link between cerebrovascular disease and depression, especially the one occurring later in life and the causal pathway may even be bi-directional. Growing evidence suggests that there may be a subtype of depression arising in later life that is characterised by a distinct clinical presentation and an association with cerebrovascular disease, namely `vascular depression’. To compare and evaluate impact of MRI white matter T2W/FLAIR hyperintensities of elderly with late life depression and healthy controls in males.

Material and methods: We have included 33 brain MRI scans, 20 patients with late-onset vascular depression and 13 healthy controls (mean age = 64.6 ± 11.1 years). In all subjects, T2W/ fluid-attenuated inversion recovery (FLAIR) sequences of the brain were collected during a single session using a 3T MRI machine (Siemens Skyra Medical Systems). FLAIR-hyperintense lesions were firstly visually identified, located and manually delineated, segmented and quantified (volume and number) using a 3D slicer (https://www.slicer.org). Total brain volume, gray matter volume, white matter volume, were also measured with a brain MRI (3T). Depressive symptoms were assessed with Hamilton depression scale (HDRS). Lesion volume and number was reported for the whole brain and for each hemisphere separately, without distinction between deep and periventricular lesions.

Results: A smaller total brain volume, larger white matter hyperintensities volume, were cross- sectionally associated with more depressive symptoms. After stratification on age, effect sizes were more pronounced at older ages. There was a statistical significance in total number and total regional volume of interest in brains of patients with late-onset vascular depression compared to controls ($p<0.05$). Median number of white matter hyperintensities was 19 per patient, and white matter hyperintensities median volume was 743 mm3. No difference was found between right and left hemisphere in terms of number ($p>0.05$) and volume ($p>0.05$) of white matter hyperintensities.

Conclusion: Neuroimaging markers of white matter microstructural damage were associated with depressive symptoms and progression of clinical depressive symptomatology in elderly.

Keywords: late life depression, neuroimaging, white matter hyperintensities, cerebrovascular diseases

070 CONTINUOUS VERSUS INTERRUPTED SUTURE TECHNIQUE FOR MICROVASCULAR ANASTOMOSIS IN CHICKEN WING VESSELS

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Introduction: Microvascular anastomosis is used in neurosurgery in various circumstances, such as moya moya disease, in management of patients with complex/clinoidal aneurysms and in skull base tumours. The standard technique used is an interrupted suture anastomosis. It is proposed that a continuous suture technique will probably reduce the anastomosis time, therefore minimizing the chance of ischemic insult and also produce a more secure anastomosis.

Methods: This study was designed to compare continuous suture technique (CST) and interrupted suture technique (IST) for microvascular anastomotic procedure in chicken wing vessels (arteries), evaluating various parameters including the time taken for each procedure, patency of anastomosis, recipient vessel narrowing and flow rate, immediately after the anastomotic procedure. For this study purpose, 10 specimens were randomly subjected to microvascular anastomotic procedure for each type of sutural technique. The specimens were assigned randomly into two groups:

1. Interrupted suture group (ISG, n= 10), 2. Continuous suture group (CSG, n= 10).

Results: There was a highly significant difference in duration of procedure between the two groups, i.e., lower duration with CST, over IST (p- value< 0.001). Post procedural longitudinal splitting of the BA, revealed no stenosis at anastomotic site in any of the samples of either of the groups. In the ISG (n=10), the flow rate across the anastomosis was 3.92 ± 0.45 ml/min., whereas, in the CSG (n=10), the flow rate was 3.9 ± 0.36 ml/min, the difference being insignificant with p-value > 0.05.

Conclusions: Continuous suture microvascular anastomosis is much easier, less time taking and as efficacious as interrupted suture microvascular anastomosis.

Keywords: microvascular anastomosis, chicken wings, continuous vs interrupted sutures

071 MECHANICAL THROMBECTOMY OF THE MIDDLE CEREBRAL ARTERY USING ONLY LARGE BORE ASPIRATION CATHETER

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Introduction: We present a case of thromboembolic occlusion of the right middle cerebral artery (MCA) which was successfully treated by direct thrombus aspiration using large bore aspiration catheter.

Case description: A 74-year-old man was presented at the Emergency Department after a sudden onset of left-side wekness. Diagnostic imaging showed right MCA thromboembolic occlusion. Wedecidedtoperformmechanicalthrombectomy(MT)oftheMCA occlusionusing transfemoral approach.

In the first act, guiding catheter (Neuron MAX 6F, Penumbra, Inc. Alameda, Ca USA) was positioned in the right internal carotid artery (ICA), then the aspiration catheter (RED 6F, Penumbra, Inc. Alameda, Ca USA) was carefully guided with the support of microcatheter and J-shaped microwire. Due to the impossibility of passing the microwire distal to the occlusion and positioning the microcatheter, it was decided to perform mechanical thrombectomy using only an aspiration catheter with direct aspiration.

The aspiration catheter was placed in the M1 segment of the right MCA, with the tip of the catheter in contact with the clot. The thrombus was aspirated for 2 minutes and control angiograms of the right ICA showed that flow in the MCA territory was completely restored.

Follow up computed tomography showed no pathological changes in the brain parenchyma.

Conclusion: Our case suggests that MT using large bore aspiration catheter in patients with acute ischemic stroke resulting from thromboembolic occlusion constitutes a particular procedural challenge, but is feasible, safe, and may be associated with favorable functional outcomes.

Keywords: aspiration thrombectomy; endovascular treatment

072 THE DIFFERENCE IN THE LENGTH OF HOSPITALIZATION BETWEEN PATIENTS WITH RUPTURED AND UNRUPTURED ANEURYSMS TREATED WITH ENDOVASCULAR TREATMENT

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Introduction: An intracranial aneurysm is a bulge or enlargement of the brain vessel wall and is usually the result of weakness or damage to a blood vessel. Such conditions can often go undetected until aneurysm ruptures. Rupture leads to intracranial hemorrhage and is a medical emergency with significant morbidity and mortality rate. Immediate treatment of the ruptured aneurysm is necessary. Endovascular treatment has significantly contributed to the treatment and prognosis of these patients. The purpose of our study is to test the difference in the length of hospitalization between patients with ruptured and unruptured aneurysms.

Method: A total of 90 patients with a history of intracranial aneurysms were enrolled in this study, of which 62 (69%) were female and 28 (31%) were male. Upon admission 45 patients (50%) had aneurismal rupture, while the other 45 (50%) were patients with unruptured aneurysm. Fisher's exact test was used to analyze the difference in the length of hospitalization between the patients with ruptured and unruptured aneurysms.

Results: This study includes patients aged between 27 and 76 with an average age of 56. The overall average length of hospitalization for patients with and without aneurysm rupture was 9.94 days. The shortest hospitalization was 1 day. The longest hospitalization was 87 days. The average length of hospitalization for unruptured aneurysms was 5.56, and for ruptured 14.33 days.

Conclusion: The results of our study strongly indicate that there is a significant difference in the length of hospitalization between patients with and without aneurysm rupture. Patients with ruptured aneurysms require longer hospitalization compared to the ones without rupture.

Keywords: Intracranial aneurysm; Endovascular treatment; Rupture; Hospitalization

073 ASSOCIATION BETWEEN DEMOGRAPHIC CHARACTERISTICS, RUPTURE STATUS AND OUTCOME IN PATIENTS WITH INTRACRANIAL ANEURYSM

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Introduction: Intracranial aneurysm represents pathological dilatation of cerebral arteries. It is estimated that 15-20% of these aneurysms will rupture during lifetime. Consecutive subarachnoid hemorrhage represents a serious condition followed by huge morbidity and mortality rates. Studies show that intracranial aneurysms are more common in female patients, but the incidence of ruptured aneurysms tend to be statistically significantly higher in male patients. Also, older patients are expected to have worse outcome after rupture.

The aim: The aim of this study is to isolate socio-demographic factors in our population that influence the rupture of intracranial aneurysm and hospital outcome of patients after that rupture.

Material and methods: This is a case control study that encounters all patients to whom diagnostic angiography is performed in the one year period, from January 2020 to December 2020, at the Department of Interventional Neuroradiology of University Clinical Centre of Serbia. The study included 90 patients, of which 62 (68, 89%) were female and 28 (31, 11%) were male. Mean age of patients included in this study was 56 years, while the youngest patient had 27 and the oldest 76 years. According to the modified Rankin Scale (mRS), post-rupture prognosis was divided into good (mRS≤2) and poor (mRS>2) at hospital discharge.

Results: Intracranial aneurysm rupture was confirmed in 28 female and 17 male patients, while unruptured aneurysms were diagnosed in 45 patients. Rupture was confirmed in 45, 2% of female and in 60, 7% of male patients. However, statistical analysis did not show correlation between gender and the IA rupture (p=0, 254). When it comes to association between mRS score and sex, the result showed that female patients tend to have poor outcome more often (p<0.05), while the male patients showed no significant correlation (p=0, 619).

Patients with ruptured IA were on average 56 years old, while the average age of patients without ruptured IA was 57 years. Statistical results showed no significant correlation between age and rupture status (p=0, 861). When it comes to the hospital outcome of the patients with ruptured aneurysm, the most cases with moderate and severe disabilities (mRS score >2) were found in the age group from 51 to 60 years old (38, 5%), while there were no patients above 70 years old with significant disabilities (their mRS score was under 2). Detailed statistical analysis showed significant correlation (p<0.05) between age and the poor outcome of intracranial aneurysms rupture only in the age group 51-60.

Conclusion: Based on the analysis of results in this study we came to the conclusion that in our population age and sex as socio-demographic factors do not influence the rupture of IA. On the other hand, female patients were associated with worse hospital outcome, as well as the patients in the age group between 51 and 60 years old.

Keywords: Intracranial aneurysm; aneurysm rupture; subarachnoid hemorrhage

074 SURGICAL TREATMENT OF CHRONIC SUBDURAL HEMATOMA

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Introduction: Chronic subdural hematoma (CSDH) is an organized collection of old blood located between the two brain membranes, the dura and the arachnoid. The blood collects after mechanical trauma on the head and brain.

The Aim: To determine the risk factors, size of hematoma, the influence anticoagulation therapy on the size of hematoma, and consequently on the surgical modality of treatment and outcome after surgical treatment.

Materials and methods: The research was conducted as a prospective two-year study in period from january 2021. to january 2023. at Neurosurgery Clinic and included 58 patients treated at Neurosurgery Clinic of University clinical center Niš. The data sources are entire medical documentation of each patient from the period of the first hospitalization until discharge and MSCT diagnostic.

Results: The dimensions of the hematoma in patients range from 9 mm (the smallest) to 32 mm (the largest). The average hematoma dimensions are 24.48 mm (SD = 6.58). Surgical therapy was indicated in patients with a larger hematoma(> 23-25 mm) by trepanatio simplex method (51.7%, $p<0.05$) or craniotomy (34.5%, $p<0.05$). While patients with minor subdural hematoma without significant neurological symptoms were treated conservatively (13.8%). A statistically significant difference was obtained between patients on anticoagulant therapy and those without ($p<0.01$). Based on the t-statistics, it can be observed that patients who take anticoagulant therapy and who suffer from hypertension ($p<0.05$) have a larger hematoma and surgical therapy was indicated for them.

Conclusion: Surgical treatment of chronic subdural hematoma aims to reduce the compressive effect on the brain parenchyma and to prevent rebleeding. In our study, the surgical outcome was good, clinically stable, neurologically stable 52 patients - 89.7% conservative 6 patients - 10.3%. It was concluded that surgical therapy is the best treatment option for chronic subdural hematoma.

Keywords: surgical; treatment; chronic; subdural; hematoma

075 SURGICAL TREATMENT OF ORBITAL CAVERNOMA

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Cavernous hemangioma is the most common vascular tumor of the orbit. They constitute 4% of all orbital tumors and 9 to 13% of all intracranial cavernomas]. It is a benign tumor that tends to occur in adulthood as a relatively stationary or slowly progressive lesion that can produce painless proptosis.

A 77-year-old patient reports double vision and eye muscle weakness. He presents himself to the ophthalmologist who hospitalizes him and indicates an NMR of the brain, which verifies in the lateral aspect of the left orbit, extraconally, an oval granular slightly heterogeneous moderately hypersignal change, measuring 22.5x16x23mm. The change exerts a mass effect on the surrounding soft tissue and structures, compressing and slightly dislocating the optic nerve contralaterally to the right, and leading to exophthalmos of the left eye. A neurosurgeon was consulted who indicated operative treatment.

Conscious on admission, vegetatively stable, GCS 15. Neurological findings: exophthalmos present on the left, left bulbus, lags behind in convergence, looking to the side and up, diplopia present, no lateralization on the extremities, free neck, sphincters control. The patient was examined preoperatively and operative treatment was indicated. A semicircular incision is made and a left pterional approach is made. After taking care of the soft tissues, the bone flap is cut and raised. The wall of the orbit opened. after removing the fat tissue, a tumor mass is found, which is completely removed. Create hemostasis. Plastic surgery of the orbit and dura. Drainage is placed. Places and fixes the bone cap. Soft tissues are closed in layers. The postoperative course is proceeding smoothly. The patient subjectively feels better, denies double images and the eye has returned to its original position. Pathohistological diagnosis was haemangioma cavernosum orbitae s. malformatio cavernosa venosa orbitae.

Surgical treatment of symptomatic orbital cavernomas is safe and effective. Tumor location dictates the choice of surgical approach.

Keywords: double images, orbital tumor, hemangioma, pterional approach

076 CERVICAL CAVERNOMA COMPLICATED WITH EXTENDED HEMORRHAGE: A COMPLEX CASE OF A 31-YEAR-OLD MALE PATIENT

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Introduction: Cervical cavernomas are rare vascular malformations characterized by abnormally dilated blood vessels within the central nervous system, with a peak presentation during the fourth decade, especially in female patients. Often, they are associated with the potential for catastrophic hemorrhagic events. This case report presents a rare and challenging case of a 31-year-old male patient diagnosed with a cervical cavernoma complicated by hemorrhage extending to the medulla oblongata.

Case report: A 31-year-old male patient, with no significant history, presented to the neurosurgical clinic with tetraplegia and acute respiratory failure with mechanical ventilation. The patient’s symptoms commenced a week prior to admission with paresthesia and pain on the right side of the body, followed by a progressive development of a bilateral motor deficit, mostly of the lower limbs. Laboratory findings excluded a possible diagnosis of Guillain-Barré syndrome, however the cervical and cerebral contrast MRI findings showed a bulbo-medullary mass with a haematic component and important medullary edema. Thus, the diagnosis of a possible ruptured cervical cavernoma was placed.

On examination, the patient was conscious, with mechanical ventilation, preserved oculomotor and oculocephalic reflexes, flaccid tetraplegia, with a slight Babinski reflex present on the right foot and absent achilean, bicipital and tricipital reflexes.

A microsurgical resection of the cavernoma was undertaken, which was meticulously executed due to its proximity to critical neurovascular structures. The tumor was approached via a C3-C4 laminectomy combined with a suboccipital median craniotomy.

Postoperatively, the patient had no immediate neurological improvement, although the cavernoma was completely removed.

Discussions: This case underlines the significance of early diagnosis and prompt intervention in managing cervical cavernomas complicated with hemorrhage. Although this condition is rare and poses challenges in clinical management, surgical resection remains the primary therapeutic option for such patients.

The location of the tumor and the increased risk of rebleeding mandates surgical expertise and comprehensive preoperative planning to minimize potential complications.

Keywords: cervical cavernoma; medullary hemorrhage; vascular malformation; neurological deficits

077 GENDER AND AGE INFLUENCE ON RUPTURE OF BRAIN ANEURYSMS

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Introduction: Brain aneurysm represents focal dilatation of brain artery. The most common localizations are the points of branching of intracranial blood vessels and the origins of important side branches. It is estimated that 15-20% of these aneurysms will rupture during lifetime. Consecutive subarahnoid hemorrhage represents serious condition followed by huge morbidity and mortality rates.

The Aim: The aim of this study is to isolate socio-demographic factors that influence the rupture o brain aneurysms in our population.

Material and Methods: This is a case control study that encounters all patients to whom diagnostic angiography is performed in the two year period, from January 2020 to December 2021, at the Department of Interventional Neuroradiology of University Clinical Centre of Serbia. Patients were divided into two groups: patients with ruptured and unruptured brain aneurysms.The study included 247 patients, of which 182 (73.7%) were female and 65 (26.3%) were male.

Results: Intracranial aneurysm rupture was confirmed in 84 female and 39 male patients, while unruptered aneurysms were diagnosed in 124 patients. Rupture was confirmed in 46% of female and in 60% of male patients. Still, statistical analysis did not show correlation between gender and the rupture of brain aneurysms (p=0.061). The average age of patients included in this study was 56 years (the youngest patient had 18 and the oldest 82 years). Detailed statistical analysis did not showed correlation between age and the rupture of brain aneurysms (p=0.781).

Conclusion: The analysis of results of this study leads us to the conclusion that sex and age as socio-demographic factors do not influence the rupture of brain aneurysms in our population.

Keywords: brain aneurysm; subarahnoid hemorrhage; aneurysm rupture

078 CAVERNOUS MALFORMATION OF THE MEDULLA: A CASE REPORT AND LITERATURE REVIEW

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Introduction: Cavernomas, also known as cavernous angiomas, are abnormally large collections of vascular channels without brain parenchyma, intervening between the sinusoidal vessels. They are benign lesions that comprise around 8-15% of all intracranial vascular malformations, with 18-35% involving the brainstem. The majority of the cavernomas that occur in the brainstem, are found primarily in the pons, and only around 5% of them occur in the medulla.

Surgery is indicated in case of hemorrage or neurological deficits, due to their mass effect on the brainstem. There is an increased risk of rehemorrage in patients with a history of bleeding cavernomas.

Methods and data collection: A 44-year old man was transferred from a different hospital to our clinic, for a bleeding medullary cavernoma. Upon admission, pacient was sedated and intubated. After sedation, the pacient presented paraplegia and left brachial plegia, with right brachial paresis. Microsurgical resection was achieved via a suboccipital median craniotomy with an infracerebellar approach. The goal was GTR (gross total resection). Post-operative angio CT showed left pneumotorax, so a left pleural drainage and a tracheostomy tube were installed. Subsequent to a previously described suboccipital decubitus ulcer, CSF leakage through the incision was present and tested positive for P. aeruginosa. CT scan showed acute tetraventricular hydrocephalus, malignant cerebral edema, but no rehemorrage. A second intervention was performed for an external right frontal ventricular drain.

Results: Pacient is currently under supervision in the ICU. GTR of the cavernoma has been achieved. Post-operative CT scan of the external ventricular drain showed no signs of rehemorrage, but supra- and infratentorial malignant cerebral edema and brainstem ischemia were present.

Conclusions: Medullary cavernous malformations are rare lesions that lead to significant neurological deficits, due to their mass effect. GTR is the goal of the surgical approach, but post-operative deficits remain a major problem and the rarity of those lesions can pose a challenge to the surgery, in less experienced centers.

Keywords: medullary cavernoma; cavernous vascular malformation; infracerebellar approach

079 ANEURYSMS AT EARLY BRANCH OF MIDDLE CEREBRAL ARTERY

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Introduction: The cortical arteries arising from the proximal (M1) segment of the middle cerebral artery (MCA) are called "early branches". Saccular aneurisms can also develop on these branches, as with the rest of intracranial arteries. The incidence of these aneurysms is estimated to be around 8-10% of all MCA aneurisms.

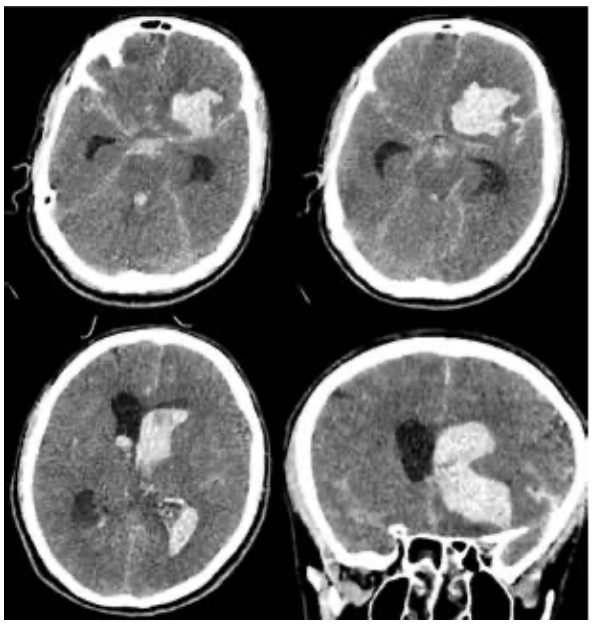
Methods: We describe a case of ruptured M1/early branch aneurism and review the applicable angiographic characteristics and surgical nuances in treating such lesion.

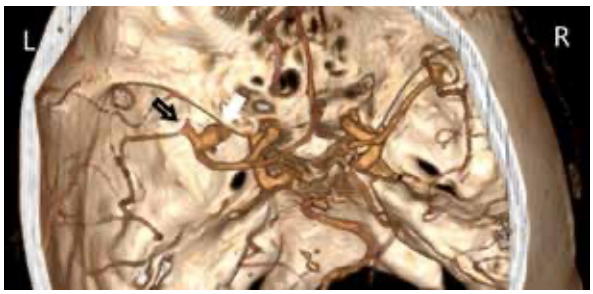
Results: We present a case of ruptured MCA/early branch aneurism resulting in subarachnoid hemorrhage, intraparenchymal and intraventricular hematoma, presenting with Hunt & Hess grade V, with dilated pupil on the left side. CT scan and CT angiography were performed demonstrating a ruptured saccular aneurism on the left MCA. Orientation of the aneurism was inferior and anterior. The neck of the aneurism measured 4.7mm, cranial-caudal diameter of 8.8mm and side-to-side diameter of 7.1mm. Another unruptured aneurism was detected on the right sided MCA bifurcation, oriented laterally and somewhat anteriorly, measuring 6.2mm anterio-posterioly, cranial-caudal diameter of 2.9mm, and neck of 3.8mm.

Intraoperatively, the basal cisterns were opened first for the purpose of releasing cerebrospinal fluid. Following was the Sylvian fissure dissection from medial to lateral, but the severity of brain edema significantly impaired the dissection. This necessitated distal to proximal dissection which was much more easily accomplished. The M2 branches and MCA bifurcation were exposed and confirmed no presence of aneurismal sac. The rest of the M1 trunk was dissected next and an aneurism was detected about 5.5mm below the MCA bifurcation, just distal to an early branch. The aneurism was oriented anteriorly and inferiorly, towards the frontal lobe, thus the presence of intraparenchymal haematoma in the frontal lobe. Next, the MCA M1 segment was prepared for proximal control if needed, dissecting and preserving the lenticulostriate perforators at the same time. The neck of the aneurism was exposed and circumferentially dissected, exposing and preserving the early branch. Clipping was performed next at the neck of the aneurism, using a straight aneurysm clip, excluding the aneurism from circulation.

Conclusions: Early branch aneurysms /M1 segment aneurysms arising from early frontal and early temporal branches are relatively rare lesions and have distinct anatomic features that impact surgical management and outcome. Understanding the relationship between the recurrent lenticulostriate arteries arising from the proximal segments of these early branches and the aneurysm neck should allow surgeons to avoid many postoperative ischemic complications when dealing with these challenging lesions.

Keywords: aneurysm; middle cerebral artery; subarachnoid haemorrhage; early branch;





080 CLIPPING OFF ACOM- A2 RUPTURED ANEURYSM AFTER UNSUCCESSFUL COILING ATTEMPT

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Anterior communicating artery aneurysms account for 23–40% of ruptured intracranial aneurysms and 12–15% of unruptured aneurysms and are the most common intracranial ruptured or unruptured aneurysms. Because they have relatively complex anatomical structures and anatomical variations and are adjacent to important blood vessels and structures, in the process of microsurgical exposure of an Anterior communicating artery aneurysm, attention should be paid not only to the anatomical characteristics of the aneurysm itself but also to the adjacent important blood vessels and perforating arteries therefore, both surgical clipping and endovascular embolization are serious challenges for neurosurgeons. The shape and size of the aneurysm itself and its location relative to adjacent blood vessels also need to be considered to better complete the procedure, and this is especially true for microsurgical clipping.

Case report: 50 year old patient was admitted to our clinic presenting headache which first appeared two days before admission. During examination was fully awake, responsive and have no problems with thinking ability or memory Glasgow coma score=15 Hunt Hess=II

The CT- showed a diffuses subarachnoid hemorrhage, Modified Fisher=3 CT angiography on cerebral arteries was performed which demonstrated aneurysm on the angle of left anterior communicating artery/ anterior cerebral artery A2 segment, oriented superiorly and medially.

On the second day of hospitalization cerebral angiography with Seldinger technique was performed, which demonstrated small irregular aneurysm on precomuncating part of Acom ant with sacus diameter 2 mm and LL promer of 0, 8mm. Coiling was attempted, but it wasn't successful. After the unsuccessful endovascular treatment attempt, the patient was taken to the operating room. Pterional approach was chosen. After opening the dura, dissecting the most proximal part of Sylvain fissure was dissected, opticocarotid triangle was opened, the carotid cistern was meticulously dissected and the carotid bifurcation was exposed. Arachnoid bands extending from the olfactory triangle to the lateral side of the optic nerve were carefully dissected to find the ipsilateral A1 and the aneurysm. A1 and A2 segments of ACA on both sides were visualized. Temporary clips were placed on both A1 segments with duration less than 3 minutes . The aneurysm was obliterated with straight mini Yasargil clip.

Postoperative patient was fully aware, responsive, without lateral neurologic deficit. Conclusion: The clip obliteration is still golden standard for obliteration of aneurysm dome. The endovascular treatment is popular option which can be beneficial for the patient and the recovery after treatment hospital stay is short compared to the patients with clip occlusion. However the clip obliteration according to level IA clinical studies gives higher percentage of total obliteration of aneurysm and less chance for recanalization.

Keywords: aneursym; clipping; Acom aneurysm;coiling

081 PROCEDURE RELATED HEMORRHAGIC COMPLICATIONS DURING MECHANICAL THROMBECTOMY

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Introduction: Mechanical thrombectomy (MT) is now accepted as a standard treatment for the treatment of patients with ischemic stroke due to large vessel occlusions (LVO) in the anterior circulation.

Aim of Study: Intracranial hemorrhage is one of the most feared complications following brain infarction and is strongly associated with poor outcomes. We wanted the demonstrate different situations of procedure-related hemorrhagic complications during MT for LVO in order to try to prevent them in future and to anticipate appropriate reaction when they acure.

Methods: We retrospectively analyzed 380 conscecutive patients treated with MT in the University Clinical Centre of Serbia performed from January 2018 to May 2023 for hemorrhagic complications. All the details of periprocedural events were notified and patients were radiologically and clinically followed. Technical outcome was accessed by mTICI scale and clinical outcome by 3 months mRS.

Results: In our cohort, we found 4 procedure-related hemorrhagic complications, two of the patients died and the other two recovered to the level of mRS 5 and 2.

Conclusion: Procedure-induced hemorrhage complications are rare and potentially disastrous events of which interventionalists need to be aware and be prepared for adequate endovascular solutions.

Keywords: Endovascular Therapy; Hemorrhage; Mechanical Thrombectomy; Stroke

082 IMPACT OF SPECIFIC CLINICAL RISK FACTORS ON BRAIN ANEURYSM RUPTURE

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Background: Aneurysm is a focal dilatation of blood vessels, mainly arterial, that is commonly induced by weakening of vessel wall. This weakening can be caused by a number of pathological changes. Brain aneurysm rupture can lead to hemorrhagic stroke, coma, and death. Therefore, recognition of risk factors for aneurysmal rupture is of major clinical importance.

The aim of this study is establishing the correlation between specific potential risk factors (prior bleeding from ruptured aneurysm, hypertension, diabetes, kidney, and heart disease) and rupture of brain aneurysm.

Methods: A total of 90 patients with a history of intracranial aneurysms were enrolled in this study. Upon admission 45 patients (50%) had aneurismal rupture, while the other 45 (50%) unruptured represent control group of this study. Fisher's exact test was used to analyze the correlation between aneurysmal hemorrhage of any type (ICH, IVH, SAH) with potential risk factors (hypertension, diabetes, heart disease, kidney disease, prior ICH, IVH or SAH).

Results: Patients included in the study were aged between 27 and 76. Mean age of patients was 56. 62 of patients were women (69%) and 28 were men (31%). Significant statistical association has been showed between hypertension (N=35, 77.8%) and aneurismal hemorrhage ($p<0.05$). Significant association has been also showed between prior ICH and aneurysmal rupture ($p<0$, 05). No significant association was shown between rupture and other tested risk factors.

Conclusion: Analyzed data suggests that hypertension can be qualified as major risk factor for brain aneurysm rupture. As expected, patients who retrospectively underwent medical procedure for prior aneurysmal hemorrhage were in lesser risk of developing further aneurysmal rupture. Data also suggests that diabetes mellitus, kidney and heart disease can be excluded as potential risk factors, but further studies are needed regarding the grade of these diseases and their impact on rupture.

Keywords: brain aneurysm; aneurysm rupture; risk factors; hypertension

083 ENLARGEMENT TO A SACCULAR ANEURYSM AND SUBSEQUENT RUPTURE OF INFUNDIBULAR WIDENING OF POSTERIOR COMMUNICATING ARTERY

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Case: A small dilatation known as infundibular widening (IFw) is frequently seen (7%- 25%) on the posterior communicating artery (PComA) at its origin from the internal carotid artery. Development and subsequent rupture of an aneurysm on a previously radiographically demonstrated IFw has rarely been documented. We present two patients who suffered from subarachnoid hemorrhage (SAH). Initial cerebral angiography demonstrated IFw on PComA. They were readmitted to the hospital 9 and 11 years later, after a new SAH. Repeated cerebral angiography revealed an aneurysm arising from the site where the IFw had been seen previously in both cases. The aneurysms were clipped with favorable outcome. This report adds two new cases documenting enlargement of PComAIFw into an aneurysm. Patients with PComAIFw, especially those who have experienced SAH, should be considered for periodic follow-up to rule out the development of an aneurysm over time.

Keywords: Neurovascular, Aneurysm, PComA

084 MICROANATOMY OF CNS PNS JUNCTION IN TRIGEMINAL, FACIAL, AND VESTIBULOCOCHLEAR NERVES

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Inroduction: The study aimed to locate the central myelin and peripheral myelin junction (CNS PNS Junction- CPJ) in trigeminal, facial and vestibulocochlear nerves.

Methods: The cisternal segments of the nerves were cut from the brainstem to the proximal margin of trigeminal ganglia (trigeminal nerve) and internal acoustic meatus (facial and vestibulocochlear nerve) from cadavers. Horizontal sections of H&E stained slides were analysed and histo morphometry was performed. The CPJ was confirmed by immunohistochemistry using monoclonal myelin basic protein antibody.

Results: The mean length of the trigeminal, facial and vestibulocochlear nerves were 13.6±3.1 mm, 12.4±1.9 mm and 11.5±2.0 mm respectively; mean length of the centrally myelinated segment at the point of maximum convexity was 4.1±1.5 mm, 3.7±1.6 mm, 3.6±1.4 mm respectively. Six different patterns were observed for the CPJ. Utilizing the derived values, the CPJ was located at a distance of 18−48% and 17−61% of the total length of the nerve in all the cases in trigeminal and facial nerve respectively. In vestibulocochlear nerve, it was located at a distance of about 13−54% of the total length of the nerve.

Conclusions: The location of the CPJ in the vestibulocochlear nerve was midway between the brainstem and internal acoustic meatus which is a novel observation. For all the nerves, the CPJ was located either at or before the half way along the length of the nerve in huge majority (97%); never crossing the 60% of the nerve length.

Keywords: CNS-PNS junction; trigeminal nerve; facial nerve; vestibulocochlear nerve

085 ANATOMICAL VARIATIONS OF THE MEDIAN NERVE: A CADAVERIC STUDY

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Objectives: Variations in the morphological anatomy of the median nerve such as formation, distribution, and communication have been well documented. All these variations should be taken into account when practicing any surgical approach for the treatment of injuries affecting the median nerve. Furthermore, they are of the utmost importance for interpretation of the clinical presentation.

Methods: The objective of this investigation was to determine the anatomical variations in the formation of the median nerve in cadavers at the Forensic Pathology department in Central Clinical Hospital of the Academy of Sciences of the Russian Federation between January 2022. and April 2022. A descriptive, cross-sectional, and prospective information source study was conducted on 42 anatomical bodies (corpses) and 84 brachial plexuses.

Results: After analyzing the results obtained in this investigation, we concluded that the median nerve presented variation in its formation in 22.6% of the investigated cases. These variations were more common in males (81.8%) than females (18.2%). The anatomical variation was unilateral in 7.1% and bilateral in 19% of all anatomical bodies examined.

Conclusions: The median nerve presented a great number of variations in its formation in roughly 23% of the anatomical bodies, with male being the predominant gender. Furthermore, the most frequent region of formation was the axillary region (92.9%). For clinicians, it is important to remember these variations during surgical procedures in this area and during brachial plexus block.

Keywords: anatomical variations; median nerve; corpses; brachial plexus; peripheral nerves

086 CORTICAL CORRELATES OF PATIENTS WITH TRAUMA AND STRESS RELATED DISORDERS- POSTTRAUMATIC STRESS DISORDER

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Introduction: Posttraumatic stress disorder (PTSD) belongs to the group of trauma and stress related disorders (DSM V). Mostly triggered by repeated exposure to the life threatening events, it is manifested by three major groups of symptoms: reexperiencing symptoms (flashbacks, nightmares, frightening thoughts), symptoms of avoidance (emotional numbness) and hyper arousal symptoms (being easily startled). Defining clinical feature, flashbacks and their manifestation, refer to subcortical orienting brain network. Most of tprevious investigations indicate morphometric changes of the hippocampus and amygdala as core neuroanatomical substrates for the PTSD and generally group of trauma and stress related disorders. Most neuroimaging and white matter brain lesion studies support the significant role of ventromedial prefrontal cortex (vmPFC) as a moderator and inhibitor of the amygdala. Subdivisions of vmPFC, rostral anterior cingulate cortex and orbitofrontal cortex with their associated inhibitory pathways interact for adequate inhibitory control of the amygdala and emotional regulation within clinical manifestation of PTSD.

Aim: To identify, delineate and analyze potential differences in specific brain cortical areas correlated with areas involved in emotional regulation in posttraumatic stress disorder patients compared to healthy controls. All the results were statistically processed at 95% probability level.

Patients and Methods: Forty nine male patients with posttraumatic stress disorder and twenty healthy controls underwent 3T structural magnetic resonance imaging scans. Volumes of specific cortical brain areas were evaluated by using FMRIB Software Library (Freesurfer analysis is performed on MP-RAGE images to create the gray-white matter surfaces but it also segmentsbrain gray-white matter into different cortical regions based on sulci and gyri pattern, and also segments major subcortical regions in the brain). Volumes were compared between the examined groups across the cortical brain regions, respectively. All the results were statistically processed at 95% probability level.

Results: Our results showed that male patients with PTSD had significantly smaller volume of cortical areas in prefrontal cortices on the right side, insula on both hemispheres and the rostral anterior cingulate cortex on the right side of the hemisphere.

Conclusions: Brain morphological changes in specific parts might be more responsible for the emotional deterioration and possible dysfunctional interactions in patients with posttraumatic stress disorder than intellectual deterioration in male patients with trauma and stress related disorders and PTSD.

Keywords: PTSD, brain cortical areas, structural neuroimaging, emotional regulation

087 ANATOMICAL VARIATIONS OF THE SCIATIC NERVE EXIT FROM THE PELVIS AND ITS RELATIONSHIP WITH THE PIRIFORMIS MUSCLE: A CADAVERIC STUDY

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Background: The sciatic nerve (SN) is the widest nerve of the human body that exits the pelvis through the greater sciatic foramen, usually below the piriformis muscle (PM), and descends between the greater trochanter of the femur and ischial tuberosity of the pelvis to the knee. The aim of this paper is to examine and identify the SN variations in relation to the PM, its prevalence, pattern, and course.

Methods: A prospective-descriptive cross-sectional study was carried out to determine the frequency of anatomical variations in the exit of the SN in relation with the PM in 20 anatomical bodies (corpses) of both genders, in equal numbers.

Results: The dissection of 40 SNs in corpses of both sexes in equal numbers showed that the SN exited inferior to the PM in 37 lower limbs (92.5%); between the fascicles of the PM and inferior to the PM in two lower limbs (5%); and in one thigh, between the fascicles of the PM and superior to the PM (2.5%). Our study reported that the SN divides in its terminal branches more commonly in the proximal part of the popliteal fossa in 55% of cases, in the gluteal region in 35% of cases, and in the middle third of the thigh in 10% of cases.

Conclusions: Anatomical variations of the SN in relation to the PM are challenging for the diagnostic and therapeutic procedure in many clinical and surgical cases. Rapid recognition of the SN changes makes surgical approaches more accurate and effective. Our study confirmed that the SN exits the pelvis most commonly below the PM, although some anatomical variations may occur.

Keywords: anatomical variations; anatomy; neuroanatomy; neurosurgery; piriformis muscle; sciatic nerve.

088 HYPOFRACTIONATED GAMMA KNIFE RADIOSURGERY FOR SURGICAL BED OF METASTATIC BRAIN TUMORS

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Introduction: Previous studies have demonstrated the benefits of surgical resection of metastatic brain tumors (METs) for selected patients, including improved neurological symptoms and increased overall survival. However, surgery alone is associated with a high local recurrence rate, necessitating postoperative radiation therapy. Our aim was to evaluate the effectiveness and safety of frameless hypofractionated Gamma Knife radiosurgery (hfGKRS) in the treatment of surgical beds.

Methods: We conducted a retrospective review of all patients who underwent frameless hfGKRS for surgical beds within four weeks postoperatively at a single center from June 2017 to April 2023. The primary endpoint was the local control following hfGKRS treatment. The secondary endpoints included the incidence of treatment-related toxicity and overall survival.

Results: A total of 44 patients were included in our analysis, consisting of 29 females and 15 males. The median age of the patients was 58.5 years, ranging from 35 to 75 years. Lung cancer was the most common primary pathology, accounting for 38.6% of the cases. The surgical beds were predominantly located in the frontal lobe, representing 31.8% of the cases. The median time from initial cancer diagnosis to surgery was 10 months (range, 0-49 months), and the interval between surgery and hfGKRS was a median of 3 weeks (range, 1-4 weeks). The median planning target volume was 9.05 cm3 (range, 4-51.0 cm3). The hfGKRS treatment was administered in three fractions for 21 patients and in five fractions for 23 patients. The median total dose delivered was 27 Gy (range, 18-30 Gy), with a maximum dose of 60 Gy (range, 40-75 Gy). Local control was achieved in 39 out of 44 surgical beds, resulting in a local control rate of 88.6%. During a median follow-up period of 10 months (range, 2-61 months), the local control rate was 88.4% at six months and 75.7% at one year. Statistical analysis using the log-rank test revealed no significant difference in the distribution of local control concerning any clinical or treatment variable. Distant failure was observed in 14 patients (31.8%), and leptomeningeal spread was detected in 5 patients (11.4%). The progression-free survival rates were 78% at six months and 57.2% at one year. Throughout the follow-up period, 31 patients were deceased. The overall survival (OS) rates were 92.6% at six months and 83.6% at one year, with median survival estimated at 35 months (95% CI, 21.6–48.4 months). No treatment-related mortality or Grade 3 or higher toxicity was observed in the patient cohort.

Conclusion: Our results suggest that frameless hfGKRS to surgical bed is a rational alternative to WBRT in selected patients with durable local control.

Keywords: Gamma Knife radiosurgery; hypofractionation; metastasis; radiosurgery, surgical bed

089 GLOBAL NEUROSURGERY AND THE ROLE OF STUDENTS AND TRAINEES

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Introduction: Global neurosurgery is a field of practice, research, education, advocacy, and policy at the nexus of neurosurgery and public health that seeks to expand access to safe, timely, and affordable neurosurgical care to all worldwide. As the future of neurosurgery, involvement of medical students and trainees is essential to sustainably advance global neurosurgery initiatives. We describe the basis for and effective incorporation of medical students and trainees in global neurosurgery.

Methods: A narrative review of literature regarding why medical students and trainees are critical to the success of global neurosurgery initiatives, outline specific roles for medical students and opportunities for involvement in the global neurosurgery space, and delineate requisite skills and competencies and relevant resources.

Results: We provide the basis for medical student and trainee involvement in global neurosurgery. Medical students and trainees are a vital resource for global neurosurgery due to their diligence, strong organizational skills, and innovative perspectives. Engaging medical students and trainees is essential to capture interest at a critical junction in their training, facilitate long-term participation in global neurosurgery, and develop a generation of neurosurgeons who are well- attuned to inequities in neurosurgery worldwide and possess the capabilities to address these inequities. Competencies include motivation, organization, collaborativeness, dependability, flexibility, resilience, creative problem-solving, ethical thinking, cultural humility, and global awareness. Important skills span the domains of research, education, advocacy, and policy. Resources for medical students and trainees interested in global neurosurgery include university programs, nonprofit organizations, and journals.

Conclusions: Medical students and trainees are fundamental to current and future initiatives in global neurosurgery. Understanding the rationale for their involvement in the field, ensuring opportunities for involvement, and facilitating the development of key competencies and skills will benefit the field of global neurosurgery.

Keywords: global health; global surgery; health disparities; health equity; public health

090 FIRST NEUROSURGICAL INTERVENTIONS AND OPERATIONS IN ZEMUN HOSPITAL

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Observing the development of the Zemun Hospital, one of the oldest hospitals in the Balkan region, it is very likely that long before the official opening of the neurosurgery department, patients with brain injuries were also treated in this hospital, especially since the hospital was on the border between the Ottoman Empire and Austria, two countries that often went to war with each other. These speculations are supported by the fact that after the battle on Mišar in August 1806, the Zemun surgeon Endredi treated the duke Janko Popović Cincar, who suffered a serious head injury in the battle, from which he successfully recovered. Duke Janko later continued his national liberation struggle and was honored by Karađorđe, most likely in 1808.

Based on written documents, it is also known that the first neurosurgical operation on the today's Serbia territory was performed by Professor Vojislav Subotić, who is considered the father of modern surgery in Serbia. Namely, professor Subotić reported on April 17, 1897 at the meeting of the Serbian Medical Association that he had operated on a two-and-a-half-year-old child because of frontal meningocele the previous year, i.e. in 1896, and on the same occasion he stated that he had performed a similar operation in 1888. in the old building of the hospital in Zemun, on the corner of Majakovskog and Bežanijska streets. On the same day, professor Subotić reported probably the first attempt at trigeminal neuralgia operation using famous Ullman's method.

Thanks to the research work of neurosurgeon Nebojša Pajević, data on neurosurgical operations in Zemun hospital performed by other surgeons were also found. Pajević found the oldest operative protocol from 1899. under serial number 105, in which it is noted that doctor Milan Crlenjak operated on an occipital meningocele in a newborn who was only two days old. The child died after 3 weeks due to cerebrospinal fluid fistula. This operation was performed in today's hospital building in Vrtlarska Street. This is also the oldest written document about a neurosurgical operation in the Zemun Hospital.

Keywords: Neurosurgery; Zemun hospital; History;

091 THE IMPORTANCE OF SOCIAL NETWORKS IN NEUROSURGERY TRAINING IN LOW/MIDDLE INCOME COUNTRIES

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The field of neurosurgery is an art constantly changing, with the advent of new techniques, tools, and technologies being developed to improve patient outcomes. For neurosurgeons to stay updated with these advancements and continuously improve their skills,

they must have access to high-quality education and training opportunities. One essential tool that has emerged as a valuable resource for neurosurgery training are the social networks.Social networks, such as Twitter and Facebook, have become increasingly popular and revolutionized how we communicate and share information. In the medicine field , social networks have been used to facilitate communication and collaboration between healthcare professionals, as well provide access to medical knowledge and training resources. In addition to Twitter and Facebook, other social networks have emerged as valuable tools for neurosurgery training. One such platform is Instagram, which has gained popularity among medical professionals due to its visual nature. 1, 2

Neurosurgeons can use Instagram to share images and videos of surgical procedures, neuroanatomy, and pathology, allowing for a more engaging and interactive learning experience. Instagram also offers the opportunity to connect with other neurosurgeons and medical professionals worldwide, creating a global network of knowledge-sharing and collaboration (3). LinkedIn is primarily known as a professional networking site, it also offers a range of educational resources, including online courses, webinars, and discussion forums. Neurosurgery trainees can use LinkedIn to connect with mentors and experts in the field. YouTube is another social network that has become increasingly important in neurosurgery training. The platform offers a vast library of educational audiovisual content on a range of topics, from anatomy and physiology to surgical techniques and procedures. Neurosurgery trainees can use YouTube to access tutorials, lectures, and case presentations, allowing for a more immersive and self-directed learning.

Results: Demographics: The vast majority of respondents (85.9%) were male, while 14.1% were female, and one respondent (0.5%) preferred not to disclose their gender.The highest proportion of respondents were neurosurgery residents (42.9%), closely followed by practicing neurosurgeons (39.9%). Medical students accounted for 14.8% of the sample, and the remaining 2.81% were other healthcare professionals including a medical officer, medical general, neuro- radiologist, and neurologist.

The largest group of respondents had 1 year of experience in neurosurgery (13.3%), followed by those with 3 years of experience (12.8%). The remainder of the respondents had varied years of experience ranging from 0 to 35 years, with 13.3% of them not answering this question.

Access to Training Resources and Use of Social Media: Most of the respondents felt the availability of neurosurgery training resources in their countries was poor (42.8%) or very poor (23.4%), while 32.8% rated it as good, and a minority (5.5%) as excellent.

The vast majority (88.6%) reported using social media for professional purposes in the field of neurosurgery.

The most popular platforms were WhatsApp and YouTube (both at 58%), followed by Instagram (48%).

Content Sought on Social Media: The most sought-after content on social media related to neurosurgery were surgical technique videos (67.5%), research papers (62.6%), and webinars (57.6%).

Social Media and Professional Development:

Conclusion: Our article highlights the vital and growing role of social media in neurosurgery training and practice in LIC/MIC. Our respondents, consisting of a majority of male practitioners from both rural and urban settings, have indicated a considerable reliance on these digital platforms for professional development, resource sharing, and collaboration. Moreover, the broad range of social media platforms used and the diverse types of content sought underlines the versatility and comprehensive nature of these tools.

Social media presents a cost-effective and far-reaching solution to this challenge, providing a platform that transcends geographic and economic barriers to offer global expertise, foster greater networking opportunities, and enhance access to training resources. The transformative potential of digital technologies, therefore, must be leveraged strategically to address these gaps. A vast majority of respondents foresee a future where social media will continue to play a pivotal role in neurosurgery training. This indicates a readiness to adapt to and embrace these changes across the profession, which is a promising sign for the future.

Keywords: Low income, social media, global neurosurgery

092 NEUROSURGICAL SERVICE IN ARCHIPELAGIC PROVINCE IN LOW MIDDLE INCOME COUNTRY

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Indonesia is the largest archipelago in the world, spanning a total of 17, 504 islands. East Nusa Tenggara is one of the provinces located in the eastern side of the country. As an archipelago province itself, it has more than a thousand islands separated by 290km of sea. Neurosurgery service is only available at Kupang, the province capital. Therefore, all neurosurgical patients would have to be referred to Kupang. With a population of 5.4 million, East Nusa Tenggara is only served by two neurosurgeons and has a total of only 10 ICU beds for neurosurgery. Moreover, its geography also poses a significant problem. The transport time ranges from 5 to more than 24 hours, either by land or sea. There was a total of 1, 350 surgeries between 2019 and 2023, with trauma and neurovascular leading the number of cases. From our cohort, we found that intracerebral hemorrhage (ICH) patient underwent a median (IQR) of 6 hours (1.6 – 24.0) from onset to primary hospital, 27.5 hours (18.3 – 66.3) from onset to definitive hospital, and 58 hours (22.5 – 85.0) from onset to surgery. As trauma and neurovascular patients require timely care, the presence of delay worsens outcomes. Several possible solutions are air emergency service, public education, financial help, more ICU beds, and opening new neurosurgery services. In the long-term, opening new neurosurgery services in other area would give the most benefits. Currently, East Nusa Tenggara is in the process of preparing several of its district hospitals to have neurosurgery capability.

Keywords: Neurosurgical; Neurosurgeon; Archipelago; Public health

093 GLOBAL NEUROSURGERY: ALLEVIATING NEUROSURGICAL DISEASE BURDEN FROM WAKE OF PANDEMIC TO HAVOC OF FLOODING. PAKISTAN'S FIRST NEUROSURGICAL RURAL OUTREACH SURVEY

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Global neurosurgery has suffered significantly as a field in our fight against novel Corona virus . Neurosurgeons were forced to reduce the frequency of performing both elective and emergency surgeries in the absence of proper procedural protocols and insufficient personal protection equipments at their respective institutions, worldwide. As a lower middle income country, neurosurgery practice in Pakistan has had its own set of limitations, what with lack of public awareness, dearth of well-trained neurosurgeons and state of art neurosurgical facilities.

Our study aims to analyze the neurosurgical disease burden in rural Sindh and facilitate neurosurgery practice from wake of pandemic to flooding havoc. A Pre designed a Rural Outreach Program to conduct a series of free neurosurgical camps across 24 Districts of Sindh was formatted, excluding Karachi, in a tenure of one year.A team of Volunteers including consultant neurosurgeon, residents , house officers , anesthetist , radiologist, pediatrician , paramedical staff was formed. We carried out a cross-sectional survey to explore the number of patients turning up at each camp, their age and gender strata, their common complains, stratification of operable cases, the rate of follow up and post-op complications. Each camp was setup in collaboration with private-secondary care hospitals of the town/city, & latter with GOVT OF SINDH during flooding times, No monetary support was taken from those hospitals. All patients with neurological/ neurosurgical complaints were included in our study.All patients were scrutinized through covid and baseline investigation , fitness was taken from our different volunteer consultants.A grand total of 1875 patients turned up for registration. The predominant age group among those who underwent surgery was children under 5 years . The most commonly occurring complaint was non-specific headache, succeeded by psychiatric disorders, Sinusitis, Epilepsy , degenerative disc disease, Hydrocephalus , cerebral palsy, meningomyelocele and tumors. 353 of the cases were diagnosed as operable out of which only 101 came for follow up, had their fitness done, were tested for COVID-19 and 45 cases have been operated so far. This Rural Outreach Program is first of its kind in our country.

The gap in between neurosurgeons' distribution rate and neurological disease burden amongst lower middle income countries like Pakistan is huge, and can only be bridged by encouraging more such activities at a national scale with proper planning and funding from the government and private enterprises.

Keywords: out reach , pandemic , flooding , neurosurgical burden

094 PINEAL REGION TUMOR: A 10-YEARS' EXPERIENCE IN EASTERN INDONESIA'S TERTIARY CENTER

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Background: Tumors occurring in the pineal region are uncommon, overall incidence is 0, 10 per 100.000 population. Pineal region tumor embraces 2, 7% of all pediatric brain tumors. Epidemiology for pineal region tumor in Southeast Asia region has not been elucidated.

Method: Data were taken from medical records from January until December 2022. Tumor grades were assigned based on the latest edition of the WHO Classification. 30 patients were treated at Dr. Soetomo General Hospital were analyzed.

Results: The most common pineal region tumors is GCT. Pineal region tumors can be approached safely and effectively. There were 21 boys (70%) and 9 girls (30%). Within age, there was 1 case (0, 4%) in less than 1 year old patient, which is 8 months, while others are 5 cases (16, 6%) within range 1-5 years old, 6 cases (20%) within range 6-10 years old, and most of cases are in 10-18 years old, which comprises 18 cases (60%) of this series. Mean age was 10, 4 years.

Conclusion: Prognosis is not merely depend on the pathologies and treatment modalities. Among other chief complaints, patient who had decreased of consciousness ended up with a worse outcome.

Keywords: pineal region tumor; pediatric brain tumor; germinoma;southeast asia; indonesia

095 DOCTOR RADOMIR DAVIDOVIĆ, A NEUROSURGEON AND A WAR SURGEON

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Doctor Radomir Davidović was born in 1934 in Ada (Serbia). He began his medical studies in Sarajevo and finished in Belgrade in 1962. He was very interested in anatomy, so for all 5 years of his studies, after passing the exam in anatomy, he worked as a demonstrator at the Anatomical Institute "Niko Miljanić" in Belgrade. It is not surprising that in 1964 he was chosen as an assistant in the subject of anatomy at the Faculty of Medicine in Novi Sad, and a little later he was elected for assistant professor. With a scholarship from the Provincial scholarship found, doctor Davidović started neurosurgery residency, which he completed at the Military Medical Academy in Belgrade under the mentorship of Professor Nedeljko Ercegovac. In December 1973, he defended his doctoral dissertation.

Doctor Davidović was a co-founder of the neurosurgery department at Clinical hospital Center Zemun together with Professor Nedeljko Ercegovac. He was the head of the department from 1984, until 1991, when, together with several other doctors from the Zemun hospital, he went to the war zone in Bosnia and formed a hospital in the town of Milići under the name "Sveti Nikola Hospital". For establishing a large hospital in war zone, he received medal of honor from the Army of Republic of Serbia.

Doctor Radomir Davidović was an assistant professor of anatomy at the Faculty of Medicine in Novi Sad, and he was also a member of the Council of the Faculty of Medicine in Novi Sad, president of the trade union branch, member of the scientific teaching council and member of the committee for scientific work of the Faculty of Medicine in Novi Sad. Due to his merits in his work and the contribution he made in difficult times, he was appointed as the ambassador of Bosnia and Herzegovina in Australia, and he also became a member of the state senate.

Unfortunately, doctor Radomir Davidović fell ill with leukemia, for which he was treated at the Military Medical Academy, as well as at the Clinical hospital Center Zemun. Unfortunately, the disease progressed quickly and doctor Radomir Davidović passed away on April 21, 2006.

Keywords: Keywords History; Neurosurgery; War;

096 BIOETHICS IN NEUROSURGERY

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Introduction: Neurosurgical conditions require key ethical considerations beyond those related to other medical diseases due to their unique impact on, associated morbidity and mortality, and the invasiveness of neurosurgical and neuromodulatory treatments. In this talk, the author provides an overview of the primary principles of bioethics and their application to neurosurgical care, provides an overview of key ethical issues and special situations in the neurosurgical management of conditions, and highlights methods to improve ethical decision-making.

Methods: A narrative review of ethical literature in neurosurgery was performed and supplemented with literature from medical ethics.

Results: Primary principles of bioethics are beneficence, nonmaleficence, respect for patient autonomy, and justice. Narrative ethics provides a useful adjunct to principalism. Key ethical issues include the role of neurosurgeons and multidisciplinary care teams, weighing of risks and benefits, decision-making capacity and informed consent, access to care and resource allocation, uncertainty, responsibility, futility, privacy and safety, and the role of culture and faith. A three-tiered approach consisting of – 1) gathering information and assessing the risks and benefits of different treatment options, 2) clear communication with the patient or proxy regarding patient values and preferences, concerns, and barriers to treatment with subsequent selection of a treatment option, and 3) long-term decision maintenance through continued two-way discussion and counseling – may promote optimal treatment of individuals suffering from neurosurgical conditions aligned with ethical standards.

Conclusions: A myriad of ethical issues affect the provision of neurosurgical care. Harmonization of these issues through a comprehensive model is necessary to promote ethical decision-making throughout the entirety of the patient-neurosurgeon relationship.

Keywords: decision-making; ethics; informed consent; medical ethics; patient education

097 EMPOWERING THE FUTURE OF NEUROSCIENCE: THE NEUROPEDIA SUCCESS STORY

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1. Neuropedia for Training and Scientific Research

Neuropedia, an innovative non-governmental organization (NGO) based in Jordan , stands as a pioneering force in neuroscience education. As the first of its kind in the country, the Middle East, and potentially the world, Neuropedia offers a comprehensive platform covering all facets of neuro-related subjects including neurosurgery, neurology, neuroscience, and psychiatry.

With a mission to foster a new generation of neuroscientists, Neuropedia focuses on equipping medical students with the essential skills and knowledge to excel in the complex realm of neuroscience. Through workshops, training programs, and research opportunities, the organization empowers students to engage deeply with the field.

A notable achievement is Neuropedia's annual student-led conference, offering a unique space for participants to present their research, connect with experts, and explore the latest advancements in neurosciences.

By transcending geographical boundaries, Neuropedia has created a global community of passionate learners, igniting collaboration among aspiring neuroscientists internationally. With its inclusive approach to education, Neuropedia is revolutionizing the way neurosciences are taught and learned.

In the landscape of medical education, Neuropedia stands as a pioneering model, demonstrating how an NGO can make a transformative impact on the future of neuroscience.

Keywords: Neuropedia, Neuropedia.net , Scientific Research , Medical Students

098 THROUGH WAR, COMMUNISM AND TRANSFORMATION. HOW POLITICAL CHANGES IN EUROPE INFLUENCED DEVELOPMENT OF NEUROSURGERY IN XX AND XXI CENTURY IN POLAND

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Introduction: The 20th and 21st centuries were a period of turbulent political and social change in Europe and throughout the world. It was also a time of incredibly dynamic development of neurosurgery. Over the last hundred years we have come a long way from operations based solely on neurological examination and surgeons' intuition to robotic procedures and intraoperative magnetic resonance imaging. In this lecture I discuss the impact of political, economic and social changes on the development of neurosurgery. I discuss the impact of funding, management but also international relations using the example of Poland, whose history in the 20th and 21st centuries focuses like a lens the transformations that have taken place on our continent.

Materials and methods: Available historical articles, memoirs and diaries were analysed. A number of interviews with retired neurosurgeons were held.

Summary: In 1918, after more than 200 years of partition, Poland regained its independence. In the interwar period, there were isolated attempts to establish a neurosurgical centre in Warsaw, Krakow and Lviv. The groundbreaking figure, on whose life the first part of the lecture is based, is Professor Jerzy Choróbski, who in the 1930s studied under a Rockefeller family scholarship at McGill Hospital in Montréal under the supervision of Professor Wilder Penfield. It was Choróbski who initiated the first Neurosurgical Clinic in Poland. Development was interrupted by the Second World War, during which the Clinic's staff helped the persecuted Jewish population and fought as part of Polish partisan organisations.

After the war, Poland found itself in the USSR's sphere of influence. It was a period of international isolation, but also a period of dynamic reconstruction. After the thaw of 1957, another generation could train in Penfield's clinic. Despite the communist regime, this was a very dynamic period in the development of Polish neurosurgery. The 1980s, were a decade of martial law period following the Solidarity protests and the decline of communism. It was also a time of slowdown in the development of medicine and science.

After the changes of 1989, medicine also remained in the background in the emerging capitalism, and the underfunding of health care resulted in technological backwardness and stagnation. It was the beginning of the formation of the private sector in Polish medicine.

After accession to the EU in 2004, the situation began to change. The period of dynamic political change was behind Poland. European funds allowed for a dynamic catching up of the technological lag. More and more people started to go abroad for training. However, a new problem emerged - the shortage of specialists and distribution of founds. As a result, the difference in salaries between centres can be as much as tenfold. Some neurosurgeons have permanently moved to the private sector.

Each era and each change over the last hundred years has been both an opportunity and a challenge for the development of neurosurgery. In this lecture, I want to show how, by learning from the experiences of the past, we can strive for a better future.

Keywords: history of neurosurgery; Poland; neurosurgical training

099 DEVELOPMENT OF A 3D PRINTED BRAIN MODEL WITH VASCULATURE FOR NEUROSURGICAL PROCEDURE VISUALISATION AND TRAINING

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Background: Simulation-based techniques using three-dimensional models are gaining popularity in neurosurgical training. Most pre-existing models are expensive, so we felt a need to develop a real-life model using 3D printing technology to train in endoscopic third ventriculostomy.

Methods: The brain model was made using a 3D-printed resin mold from patient-specific MRI data. The mold was filled with silicone EcoflexTM 00-10 and mixed with Silc Pig® pigment additives to replicate the color and consistency of brain tissue. The dura mater was made from quick-drying silicone paste admixed with gray dye. The blood vessels were made from a silicone 3D-printed mold based on magnetic resonance imaging. Liquid containing paprika oleoresin dye was used to simulate blood and was pumped through the vessels to simulate pulsatile motion.

Results: The overall user satisfaction was very high. All neurosurgeons and residents recruited in the current study found our model to be a useful tool for surgical training. Fiftythree percent of them agreed that the simulator could help develop skills in this procedure, and the other forty- seven percent strongly agreed with this statement. Sixty-seven percent of senior neurosurgeons strongly agreed that they would be interested in using this model as a training method. Furthermore, three-quarters of neurosurgeons who had previously performed an ETV before felt the floor of the ventricle to be very similar to a real patient. Sixty-seven percent of participants agreed that the model had accurate surface anatomy, a suitable trajectory, and an appropriately detailed ventricular system. Most of the senior neurosurgeons (87%) agreed that the simulator matches the actual tissue closely. All participants agreed that the use of this model would increase resident competency, hand-eye coordination, and instrument handling. In addition, over half (53%) of the participants considered the model to be an inexpensive tool. Figure 7 reports all neurosurgeons' answers. Bleeding scenarios were successfully incorporated to subject the

trainees to real-life scenarios. Standard neuroendoscopes did not require maintenance or special storage. The production costs were 303 USD for each simulator. The simulator required 25 h to build, with 10 h of labor.

The best surgical training model is the cadaver as it gives the best anatomical picture and feeling. However, not all training centers can easily acquire cadavers given the associated costs and legal implications. Cadaver treatment for training and storage also requires a highly specialized center. During the COVID-19 pandemic, cadaveric practices were considerably reduced, demonstrating that, in the face of adversity, practice on human specimens can be significantly affected. This factor can support the use of 3D models in such situations. The 3D models made from various materials are cost-effective, reusable, and easily replicable.

Keywords: simulation; neurosurgery; 3D printing; endoscopic third ventriculostomy; ETV; virtual reality

100 SOCIAL DETERMINANTS OF HEALTH IN NEUROSURGERY

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Introduction: Social determinants of health (SDOH) are the non-medical factors that influence health outcomes, namely the social, political, economic, cultural, and environmental forces that affect the conditions of daily life throughout lifespan. These include race, gender, education, employment, income, insurance status, and discrimination. This talk explores the effect of SDOH on neurosurgical practice and outcomes.

Methods: A narrative review was conducted to identify the impact of SDOH on neurosurgical practice and outcomes.

Results: Data regarding the impact of SDOH in neurosurgery is limited. Greater disparities based on SDOH may contribute to decreased neurosurgical workforce and an increased distance required to reach neurosurgical care. SDOH, specifically race, income, education, and insurance status, predict prolonged mortality, length of stay, complication rates, need for revision surgery, missed appointments, and emergency room visits in some populations. Having a greater number of SDOH is generally associated with poorer outcomes. Gender may not be associated with morbidity or mortality related to neurosurgical procedures. Health literacy is an understated SDOH related to race, education, and income that has also been suggested to influence neurosurgical care and outcomes.

Conclusions: Although research on SDOH in neurosurgery is preliminary, SDOH fundamentally affect access to and the quality of neurosurgical care. Conducting further research to understand the impact of specific SDOH in different context and then addressing these factors is necessary to promote health equity in neurosurgery.

Keywords: health equity; healthcare disparities; global neurosurgery

101 ULTRASOUND-GUIDED MINIMALLY INVASIVE TREATMENT OF PAIN IN RECURRENT TRIGEMINAL NEURALGIA: BASIC EFFICIENCY INDICATORS

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Aim: Treatment of recurrent, intolerable and drug-resistant pain many years after operative treatment of trigeminal neuralgia.

Methods: Treatment of pain with a series of blocks under ultrasound control. A 0.5% Marcain solution, was applied directly to the branch of the trigeminal nerve in the region where there was pain of the type of trigeminal neuralgia(MVD was performed). (2ml in one place). Pain intensity was measured by the VAS scale before and at the end of the treatment. Blockades were applied every or with one day off, until pain relief (VAS≤3), or maximally 12 blocks.

Results: A total of 24 patients were treated (19 women and 5 men), average age 69.5±0.9 years, who were operated on 12.4±0.6 years ago (from 4 to 16yers) due to trigeminal neuralgia. Most often, the pain returned spontaneously, for no apparent reason (16 cases), in two cases each after tooth extraction and due to the development of diabetic neuropathy of the trigeminal nerve. A rare cause of recurrent neuralgia was H. zoster, thrombosis of the basilar artery and gluten intolerance (1 case each). Two branches were most often treated. The initial intensity of pain was 9.404±1.008 (7.8-10) on the VAS scale and after treatment 2.825±0.148 (1.8-5.6). On average, it was necessary to apply 6.29±1.083 blocks. Pain relief was achieved in 83.3%.

Conclusion: A blockades series of the terminal parts of trigeminal nerve branches with a local anesthetic under ultrasound control is an effective and safe procedure in the treatment of recurrent trigeminal neuralgia, resistant to drugs.

Keywords: trigeminal neuralgia, recurrent pain, treatment, ultrasound control

102 ROBOTIC SPINE SURGERY. REVOLUTION, EVOLUTION OR A SEPARATE DEVELOPMENT PATH? SUMMARY OF 2 YEARS' EXPERIENCE OF USING A ROBOTIC SYSTEM FOR SPINAL SURGERY

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Introduction: Recently, robotic systems from various manufacturers have appeared in an increasing number of neurosurgical centres. The purchase of a system is motivated by a desire for development, an increase in the quality of surgery, patient requirements or marketing needs.

In this lecture, I present a rational evaluation of the positive and negative aspects of using a robot during spinal surgery. The analysis is based on two years of experience of our team.

Materials and methods: Since February 2021, a team of five surgeons has performed spinal stabilisation procedures using the robot and the classic method. The time of the procedures performed, the number of complications, and a detailed analysis of the learning curve taking into account previous surgical experience were analysed. An economic analysis was also carried out, comparing the price of dedicated implants offered by the robot manufacturer with systems from leading manufacturers of classic implants. Percutaneous and open systems were considered.

Results: No significant difference was observed in the number of complications, but the accuracy of screw placement was noticeably higher in the group of patients operated on with the robot. A significant difference was observed in the time taken for the operations, and this was dependent on the type of procedure. Radiation exposure was significantly lower for robotic surgery. The learning curve was noticeably shorter compared to learning classic accesses. An important observation is the risk of software failure, which was included in the total number of complications. In terms of the cost of surgery, the classical systems performed significantly more favourably. The marketing effect was noticeable.

Conclusions: Robotic systems can be a significant improvement especially for surgeons without previous experience in spinal stabilisation surgery.

Keywords: robotic surgery; spine surgery; technology.

103 DEVELOPMENT OF A NOVEL LOW-COST EXOSCOPE TO EXPAND ACCESS TO MICRONEUROSURGICAL CARE IN LOW- AND MIDDLE-INCOME COUNTRIES

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Background: Less than a quarter of the world population has access to microneurosurgical care within arange 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. Three remarkable features render our exoscope a feasible and effective alternative for magnification and illumination in the lack of an operating microscope in a low-resource environment: its low cost, its small size, and its sterilizability with ethylene oxide or other sterilizing gases. This allows a firmer grip than the sterile plastic covers used for other exoscopes.We could have reduced the cost by choosing a smaller hence cheaper monitor. As we had no previous experience with exoscope-aided surgery, however, we felt more confident looking at a larger screen. We encountered 3 key limitations to our low-cost device that impaired a smooth surgical workflow: - Lack of depth perception - Insufficient lighting in deep corridors - Cumbersome adjustment of the zoom The main hindrance of our device was the lack of depth perception due to the 2D camera. This is a typical disadvantage of exoscope systems, as previously reported by Muhammad et al. for the Modus V exoscope.This problem was particularly prominent during our first 10 cases. Over time, the hand-eye coordination of the surgeon adapted to the 2D view, allowing exoscope use for the full duration of our last 6 surgeries. Yet, we believe that it would be worth exploring whether the use of a high-definition 3D camera can accelerate the learning curve and facilitate surgery for deepseated lesions.

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 mme60 mm. The surgical field was captured by a 16-megapixel two dimensional camera and projected to a 55-inch highdefinition 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. $ 2050.

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.

Keywords: Exoscope; Global neurosurgery; Low cost; Microneurosurgery; Surgical ergonomics

104 THE ROLE OF DEEP PRAYERS IN INNOVATIONS

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Introduction: We would like to present three important innovations that were first introduced in paediatric neurosurgery, most notably the neurosurgical innovations used in the separation of craniopagus twins in 2019.

Methods: It is our experience that deep spiritual journeys help us to come up with creative ideas, whether we approach the source of our thoughts through non-religious or religious meditation. As Christians, we have been practicing the Jesus Prayer and the Rosary for the past 25 years.

Results: The technique of the vascular tunnel for severe traumatic brain swelling in the course of decompressive craniectomy, has upgraded the DC method from the optional category to the recommended category in guidelines.

The fingertip support (robot hand) technique was introduced in ultramicrosurgery, bypass surgery, which helped to separate the wessels of craniopagus twins, among other innovations.

With regular daily fresh cadaveric exercises, all these were successfully practiced among the other delicate microsurgical procedures.

Conclusion: The high international citation of our papers and more than 100 scientific presentations so far shows that spirituality and science go hand in hand to help each other.

Keywords: pediatric neurotrauma, faith and science, decompressive craniectomy, vascular microsurgery, craniopagus separation

105 IMPLEMENTATION OF THE WORLD HEALTH ORGANIZATION SURGICAL SAFETY CHECKLIST AT THE YAOUNDE CENTRAL HOSPITAL

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In Africa and in Cameroon, the quality and safety of surgical care are considered insufficient. The WHO maintains that this situation is attributable to the level of organisation of health bodies, the lack of infrastructure, medico-technical equipment and other consumables.

In 2008, the World Health Organisation launched the "Safe Surgery Saves Lives" programme, the aim of which is to increase the involvement of surgical teams and improve patient safety through compliance with the Surgical Safety Checklist (SSCL) in operating theatres. In Cameroon, the health authorities trained anaesthetists, nurses and doctors in the use of the WHO LCSC in 2015. But eight years after this initiation, the WHO LCSC is not used in almost any of the country's operating theatres.

This study examines the conditions and process of implementation of the WHO LCSC at the Yaoundé Central Hospital (HCY), through a description of its context, in order to better understand them with a view to providing guidelines and solutions for the implementation of this innovation.

This is a case study using a qualitative methodological approach backed up by quantitative data. Two methods of data collection were used. Interviews with five operating theatre managers, a manager from the hygiene and quality department (SHQ) and a questionnaire submitted to fifty- two players in the field of surgical care at the HCY enabled us to achieve our objectives. The study also used methods for analysing the context of an implementation.

The results showed that the WHO's LCSC has not yet been fully implemented at the HCY due to inadequate management of the operating theatres, a lack of quality culture and a lack of motivation on the part of those involved in the field. However, the HCY has undeniable advantages for effectively implementing this tool in its operating theatres. Its special status, its innovative management, its effective quality policy, the logistical level of its operating theatres, as well as the professionals' perception of the usefulness of the WHO's LCSC and the good working climate are all advantages for implementing the LCSC in operating theatres.

Keywords: Surgical safety checklist, operative care, patient safety, implantation

106 NEUROGENIC CLAUDICATION VERSUS ANGINA SPINALIS – CONTACT ENDOSCOPY BLOOD FLOW EVIDENCE

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Introduction: There are different postulates aims on explanation of the underlying mechanism of neurogenic claudication associated with lumbar spinal stenosis including compression or ischemia of the nerve roots. Contact endoscope is capable of visualizing red blood cells dynamics in the blood vessels. The method provides objective measurement of the microcirculation in the scanned region.

Aim: Assessment of changes in the flow rate in the dural blood vessels in spinal lumbar stenosis before and after surgical decompression.

Material and Methods: The group of 8 patients aged 40 – 65 years that underwent decompression for multilevel lumbar spinal stenosis with the measurement of the microhemodynamics of the dural vessels using contact endoscope. The images taken before and after decompression and the microhemodynamics changes observed were matched. The erythrocyte dynamics was graded into the three patterns: A: No movement, B: Pulsatile movement, C: Continuous movement.

Results: Assessment of intravascular erythrocyte flow rate before decompression revealed decreased flow in all patients consistent with flow pattern A and/or B. After decompression was completed, the flow rate was significantly increased and showed continuous erythrocyte flow.

Conclusion: Our results revealed decreased dural vessels microhemodynamics in lumbar spinal stenosis that corresponded to the severity of the spinal canal narrowing, indicating nerve roots ischemia as the underlying mechanism of the neurogenic claudication.

Keywords: spinal stenosis; neurogenic claudication; contact endoscopy blood flow patterns

107 MANAGEMENT OF SAME LEVEL RECURRENT LUMBAR DISC HERNIATION. A COMPARATIVE ANALYSIS OF POSTERIOR LUMBAR INTERBODY FUSION AND REPEAT DISCECTOMY

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Background: Recurrent lumbar disc herniation poses a challenge for spinal surgeons. There is no consensus on the best approach. Several experts suggest repeat discectomy without stabilization as the optimal management because of minimal tissue manipulation, lower blood loss, shorter hospital stay, and lower cost. However, research on the role of instability in the development and progression of disc herniation has made fusion techniques popular among spinal surgeons.

Aims: Compare the postoperative outcomes of posterior lumbar interbody fusion (PLIF) and repeat discectomy for same-level recurrent disc herniation.

Materials and methods: The patients included had previously undergone discectomy and presented with same-level recurrent lumbar disc herniation. The patients were placed into two groups: 1) discectomy only, 2) posterior lumbar interbody fusion (PLIF). Preoperative and postoperative Oswestry disability index (ODI) scores, duration of surgery, blood loss, duration of hospitalization, and complications were analyzed.

Results: There were 74 patients included in the study i.e., repeat discectomy without fusion (n=40) and PLIF (n=34). There were no significant differences in the duration of hospitalization (3.73 vs 3.29days p 0.581), operative time (101.25 vs 108.82mins, p 0.48) and blood loss i.e., 88.75mL (50–150) vs 111.47mL (30-250) (p 0.289) in repeat discectomy and PLIF respectively (Table 1). PLIF had better postoperative ODI pain score 4.21(0-10) vs 9.27(0-20) (p value of 0.018) (Table 2). Recurrence was 22.5% in repeat discectomy with 22.5% progression to fusion (fig. 1). Of the patients with recurrences and progression to fusion after discectomy, 88.9% had Modic-2 changes on preoperative magnetic resonance imaging (MRI) (fig. 2). No recurrences or adjacent segment disease (ASD) was seen in the PLIF group. Durotomy was seen in 37.5% and 11.8% in discectomy and PLIF respectively (p=0.012) (fig. 3).

Conclusions: Repeat discectomy is associated with lower blood loss and operation time. However, the risk of recurrence, progression to instability and reoperation is high. This is associated with poor long term patient satisfaction. PLIF eliminates the risk of recurrence and slows the degenerative process with better long term patient satisfaction. The presence of Modic-2 changes on preoperative MRI is associated with increased risk of herniation recurrence. In these cases, fusion of the lumbar segment should be strongly considered. The cost of implants in PLIF should be weighed against the social and economic cost of reoperation associated with discectomy without fusion.

Table 1: Analysis of the intraoperative blood loss, duration of surgery and duration of hospitalization.

Blood loss- p value 0.289					
	Average	N	Standard deviation	Minimum	Maximum
Discectomy	88.75	40	27.520	50	150
Fusion	111.47	34	46.524	30	250
Operation duration Operation- p value 0.48					
	Average	N	Standard deviation	Minimum	Maximum
Discectomy	101.25	40	26.836	60	195
Fusion	108.82	34	36.141	60	195
Duration of hospitalization- p value 0.581					
	Average	N	Standard Deviation	Minimum	Maximum
Discectomy	3.73	40	1.281	2	8
Fusion	3.29	34	1.244	2	8

Table 2: Showing the analysis of the Oswestry disability index preoperative and postoperatively.

Preoperative ODI					
	Average	N	Standard deviation	Minimum	Maximum
Discectomy	29.95	40	6.504	16	41
Fusion	31.97	34	7.230	19	43
total	30.88	74	6.875	16	43
Postoperative ODI- p Value 0.018					
	Average	N	Standard deviation	Minimum	Maximum
Discectomy	9.27	40	6.055	0	20
Fusion	4.21	34	3.082	0	10
Total	6.95	74	5.509	0	20

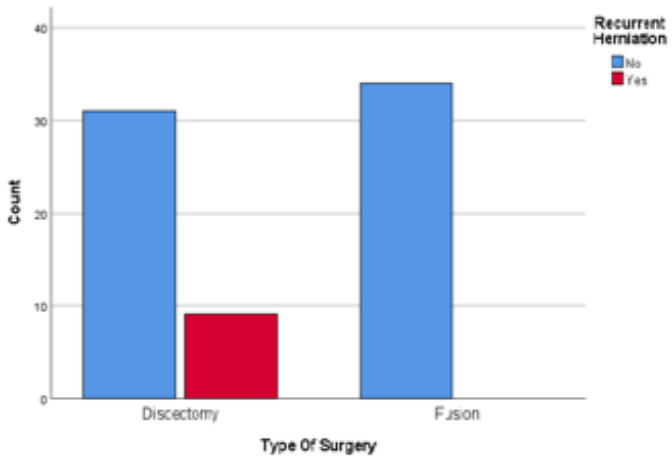

Figure 1: Discectomy was associated with a recurrence of 22.5%. No recurrences were observed in the fusion group.

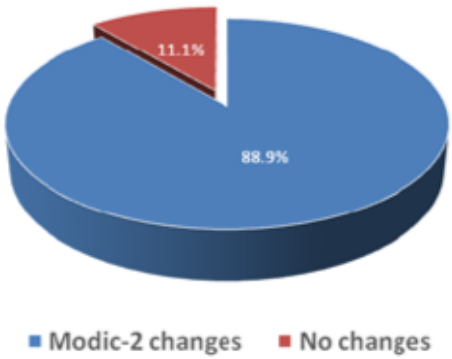

Figure 2: illustrating the presence of Modic-2 changes on preoperative MRI in patients who developed recurrences. These changes were present in 88.9% of patients with recurrence.

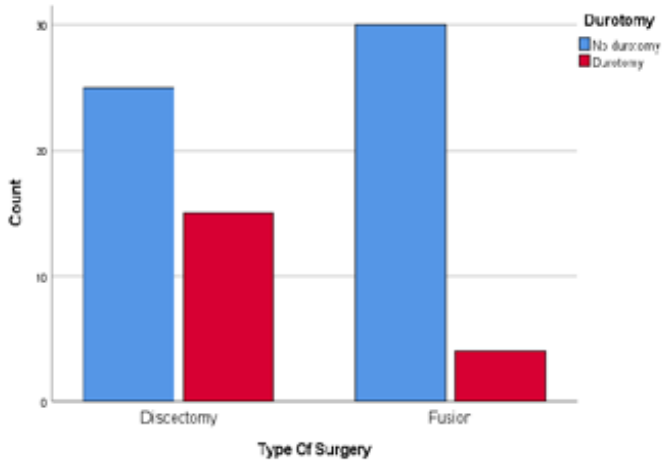

Figure 3: Durotomy was higher in the discectomy group than fusion group i.e., 37.5% vs 11.8%.

Keywords: Recurrent Lumbar disc herniation; discectomy; fusion; posterior lumbar interbody fusion; Oswestry disability index.

108 HISTOPATHOLOGICAL AND ULTRASTRUCTURAL ANALYSIS OF LIGAMENTUM FLAVUM IN PATIENTS WITH LUMBAR DISC HERNIATION AND LUMBAR SPINAL STENOSIS: A COMPARATIVE ANALYSIS

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Introduction: Many studies examined the histological structure of the ligamentum flavum (LF) in people with lumbar spinal stenosis (LSS) and often the control group were patients with lumbar disc herniation (LDH). However, no study has first demonstrated a clear clinical, morphological-radiological distinction between these two entities. After demonstrating the clinical, and morphological-radiological difference between patients with LSS and patients with LDH, the histological changes of the LF in both groups of patients were compared.

Methods: The study is a cross-sectional study conducted at the Clinical Hospital Center Zemun in Belgrade and includes patients from the period 2020 - 2021. The study includes 60 patients separated into two groups. The first group consists of 30 LDH patients, while the second group consists of 30 LSS patients. All patients were operated by the same neurosurgeon and in both groups the LF was harvested during the procedure. Demographic and clinical informations, as well as morphological-radiological data of both groups were obtained. A LF histopathological analysis was performed, followed by a statistical analysis using the methods of descriptive and analytical statistics in order to compare the obtained results between the LDH and LSS group.

Results: Around 2/3 of patients in both groups were men (63.3%). The average age in the LDH group was 45, 7±14, 7 years, while in the LSS group was 63, 1±8, 0 years. LDH group patients and the LSS group patients differed significantly in terms of frequency of chief complaints and clinical findings, other complaints, symptoms duration and findings of physical examination. Also, groups differed significantly in numerous morphological-radiological findings. Histopathological analysis of LF showed that the groups significantly differed in the amount of elastic and collagen fibers content, as well as in the structural microscopic appearance, e.g. the architecture of LF tissue which was analyised by the orientation of elastic fibers. Electron microscopic findings indicated a difference in the nerve fibers presence between the two examined groups, indicating newly described phenomenon of nerve sprouting in LSS patients group, which can be described as hyperinervation of LF in LSS patients.

Conclusion: LSS and LDH are two different spine pathology entities. LF in patients with LSS shows signs of fibrosis and scarring, which supports the inflammatory theory in the origin of spinal neurogenic claudication in patients with LSS. Showed LF hyperinervation, and nerve sprouting phenomenon can explaine origin of spinal neurogenic claudications in patients with LSS. However, more studies are needed to prove this theory.

Keywords: Lumbar disc herniation; Lumbar spinal stenosis; Ligamentum flavum

109 MINIMAL INVASIVE TUBULAR MICRODISCECTOMY IN L3 L4 FAR LATERAL DISC EXTRUSION

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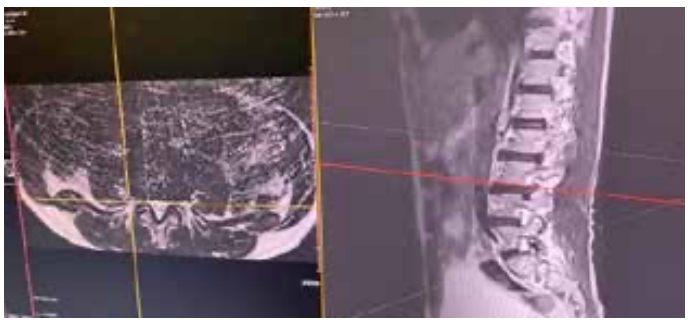
Introduction: The popularity of minimally invasive spine surgery (MISS) has increased along with tremendous advancement in surgical techniques and technologies in recent decades. With its aim of minimizing surgical morbidity and achieving the same surgical outcomes as traditional open spine procedures, MISS is advocated when possible to avoid excessive approach-related injury and subsequent preservation of the normal anatomy while allowing rapid recovery as well as a better quality of life.

Case report: We present a case of 45 years old patient presented at our department with severe radicular pain syndrome irradiating through the left leg, VAS scale 10, ODI 87%, numbness in the left thigh and diminished pattelar reflex. The symptoms started three weeks prior admission after sneezing .

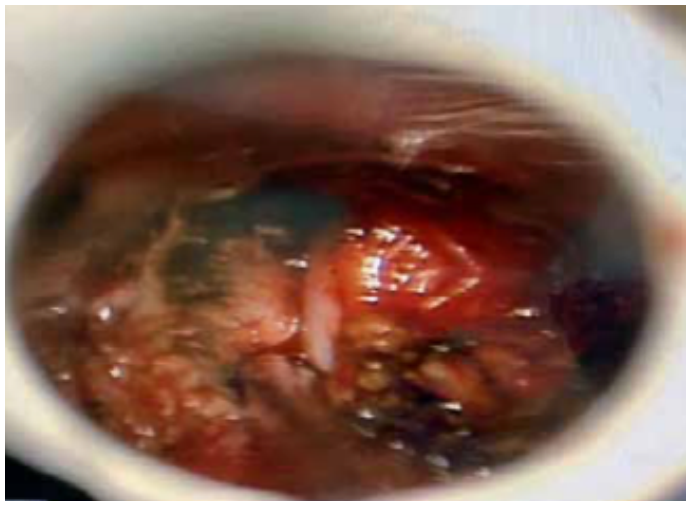
MRI of lumbosacral spine showed L3 L4 far lateral type ofdisc extrusion with signsof severe radicular compression of exiting nerve root. The patient was admitted at our departmend andafter the preoperative preparation underwent surgical decompression of the L# exiting nerve rootand extraction of the extruded disc fragment using Medtronic Metrx tubular retractor system.After the sterile preparation of the surgical site , the skin incision was plased 2cm from the midline. The width of the incision was 1, 8cm in length. After the dissection of the subcutaneous tissue and verification of the lumbo dorsal fascia , the k wire was introduced on the planedlaminar level, confirming the position with intraoperative X ray. The soft tissue dilatators were introduced accordingly with final placement of the desired tubular retractor (18mm) and X ray confirmation of the proper placement of the tube was obtained. After the dissection of the longissimus and multifundus muscles , the intertransverse fascia was identified and resected. The lateral aspect of the superior articular process , the lateral aspect of the pars interarticularis and the pedicle were identified after witch the drilling process was commenced. We performed 2-3 mm drilling on the lateral aspect of the superior articular process , we identificated and mobilized the exiting nerve root. The discal axtrusion was identificated with extraction of the disc fragment and inspection of the superior and lateral aspect of the nerve root(dorsal root ganglion region) The total operative time was 45 min without any significated blood loss. The postoperative period was uneventful with signsof significant improvement of the VAS score and the ODI index . The patient was discharged on the second postoperative day and underwent rehabilitation therapy. On the 3 months followup his VAS and ODI scores were normal.

Conclusion: The main goal of MISS is to minimize approach-related soft tissue injury and to preserve normal anatomy, which permit a better quality of life through faster postoperative recovery.



Picture 1 , MRI od lumbosacral spine

Picture 2 , intraoperative procedure



Picture 3 , far lateral disc extrusion

Keywords: miss, far lateral, spine surgery

110 INTRADURAL DISC HERNIATION AT L4/5 LEVEL CAUSING CAUDA EQUINA SYNDROME

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Introduction: Cauda equina syndrome is caused by compression or injury to the nerve roots distal to the level of the spinal cord. It presents as low back pain, motor and sensory deficits in the lower extremities, and bladder as well as bowel dysfunction. The prevalence among the general population has been estimated between 1:33, 000 and 1:100, 000. The most common cause is herniation of a lumbar intervertebral disc, which is reported by approximately one to 10 percent of patients with herniated lumbar disks.

Case report: A 60-year-old male patient with complaints of urinary and defecation dysfunction was admitted. He complained of increased and constant pain of the low back and both lower extremities that had started 5 days before. Physical examination showed weakness of both lower extremities, negative Lasseque sign on the double limbs, decreased knee tendon and ankle reflex in both lower extremities, and dysfunction of bladder and bowel.

MRI revealed extrusion with sequestration of the disc material in spinal canal at L4/5 level, causing cauda equina compression. The patient underwent a surgical decompression and extraction of the extruded disc fragment using Microscope. Bilateral interhemilaminectomy on L4-L5 was performed, after which we resected the ligamentum flavum and visualized and deliberated the L5 nerve root. Than we resected the dura using microsurgical instruments and the disc was carefully dissected from the surrounding nerve. The defect on the dura was sutured. Pathologic examination confirmed that the mass was degenerated intervertebral disc. Postoperatively he presented complete recovery of the radiculopathy and cauda equina at 4 months follow-up.

Conclusion: Acute cauda equina syndrome is an emergency with recommended surgery within 24 hours. Surgical intervention is only effective method to manage this disease and to relieve symptoms and prevent severe neurological deficits. Intradural disc herniation is defined as the extruded intervertebral disc through the dural matter and into the subarachnoid space, which is a very rare phenomenon in degenerative disc disease. Using CT and MRI is still difficult to confirm indradural herniation.In most clinical cases, the accurate diagnosis is only confirmed during operation and according to the postoperative pathology.

Preoperative MRI

Intraoperative image

Intradural disc extraction

Postoperative MRI

Keywords: spine; intradural disc; cauda equina

111 CONFUSING FINDING OF THE MEDULLARY CONUS CYST: A CASE REPORT

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Conus medullaris cyst is a rare benign ependymal medullary cyst which probably relates to abnormal persistence and cystic dilatation of the ventriculus terminalis sometimes also called terminal ventricle of Krause or 5th ventricle. This entity is rarely symptomatic with most often presentation in adulthood with bowel or bladder dysfunction.

We present a case of a 75-years-old female patient who presented to our department with gait disturbance due to progressive paraplegia predominantly of the right leg and significant bladder dysfunction. Patient symptoms started about 3 weeks before admission with severe back pain. Upon admission MRI of spine indicated intramedullary cystic lesion in the region of conus, although radiological description defined extramedullary cystic lesion at the level of L1 vertebra with compression to conus medullaris indicative of schwannoma or ependymoma. Patient was prepared and operated with laminectomy, and intraoperative finding revealed intramedullary lesion, so small medulotomy was performed and some cystic fluid was aspirated, after which Dowling's technique was performed injecting saline between the cyst and the nerve tissue. Using this technique small transparent yellowish mucous cyst popped out and was sent for histological analysis which indicated dense protein content of probably ependymal cyst. Immediately after operation patient recovered significantly with peristant bladder dysuncion. However, after 3 months she was fully mobile, without any neurological deficit and with normal bladder function.

Keywords: Conus medullaris; Cyst; Ventriculus terminalis;

112 SHORT SEGMENT POSTERIOR FIXATION WITH PEDICLE SCREWS AT THE LEVEL OF THE FRACTURE (SHORT SAME SEGMENT FIXATION - SSSF) FOR UNSTABLE THORACOLUMBAR BURST FRACTURES – DO THEY DO BETTER?

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Objective: The 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.

Methods: Retrospective analysis of 81 patients who underwent SSSF for unstable TLF over 4 years operated by a single surgeon at a tertiary care centre and completed follow up for at least 12 months were included. Patients with Kyphotic Angle (KA) of more than 25 degrees, AO type C fractures, muti-level fractures and patients with severe osteoporosis were excluded. All injuries were categorised according to AO spine classification system, TLICS score, ASIA scale. All surgeries were performed within 72 hours of admission. Radiological evaluation with Cobb angle, functional outcome with Oswestry Disability Index (ODI) and Visual Analog Scale (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. Injury segment distribution was T10-L2 and most common fracture site was L1 and most common mechanism of injury was fall from height. 36 patients had single pedicle screw inserted at the injury level (out of which 30 patients could only afford 5 screws and 6 had one pedicle disrupted) and 45 patients had both pedicles fixed at the index level.

Mean hospital stay was 5.12 days. Mean number of days before ambulation was 6.63 days. Mean pre-operative kyphosis was 16.48 degrees. Mean immediate post-operative kyphosis was 6.183. Mean kyphosis at 12 months follow up was 11.05. 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. Pre-op mean VAS score was 7.86, and 3.04 at 1 month, 1.60 at 6 months and 0.86 at 12 months($p<0.001$). Mean pre-op ODI was 69.68 and 14.84 at 6 months and 9.41 at 12 months. There was a significant difference between pre-op ODI and follow up ODI at both 6 and 12 months($p<0.001$). Mean operative blood loss was 111.6 ml. Mean operative time was 84.89 minutes.

There was no difference in VAS scores, ODI scores, hospital stay, blood loss, operative time, time before ambulation; between single pedicle vs both pedicles fixed groups at the fractured level. Only difference noted between above groups was kyphosis correction at immediate post-op period. No significance between the groups for other KA parameters noted. Number of failures at 12 months were 4 with 2 Pseudoarthrosis and 2 hardware failures (screw pull out).

Conclusion: SSSF shows significant improvement in pain scores, functional outcomes and kyphotic angles 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.

Keywords: Short Same Segment Fixation; Unstable Thoracolumbar Fractures;Kyphosis Correction

113 ROSTRAL MIGRATION OF INTRADURAL BULLET FROM LUMBAR TO THORACIC SPINE: CASE REPORT AND REVIEW OF THE LITERATURE

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Migration of bullet in the canal is rare and intradural migration is even rarer. Most migration are caudal to the site of trauma. This case presents present a case of 27 years old man who sustained a bullet injury on his back at L1 with no exit site. He was having generalized tenderness on his abdomen and complete neurologic injury below the L1 level. Laparotomy was done and turned out to be negative laparotomy then a CT scan was taken to locate the bullet in T4. The patient prepared with T4 laminectomy intradural intramedullary bullet was removed under fluoroscopic guidance. The patient had no complications and was discharged.

Neurosurgical management of bullet injury is controversial but there are some clear surgical indications for surgery. Complete neurologic injury has a grim prognosis as compared to patients with incomplete injury. It's better to keep in mind the probability of rostral migration of bullet in cases of bullet injury to the spine.

Keywords: bullet migration; intracanal bullet; spinal cord injury

114 NEURO-UROLOGICAL EXAMINATION TECHNIQUE IN SPINAL NEUROSURGERY DEPARTMENT

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Hypothesis/ aims of study: Thorough diagnosis of urinary tract dysfunctions does require of complex and comprehensive examination including some invasive and time-consuming manipulations such as complex (video)urodynamic study and cystoscopy. Within the neurosurgical setting however, some of these methods may not be feasible due to short hospitalization time and general physical condition of the patient. Neuro-urological examination is therefore essential for timely identification of hidden dysfunctions of lower urinary tract and tendencies for their manifestation.

Study design, materials and methods: At our institution, modified technique for neuro- urological examination prior neurosurgery and in immediate postoperative period was developed and implemented as a part of a routine examination. The examination included detailed study of the medical examination and pre-operative MRI/CT images and reports. While gathering patient's anamnesis, focus was made on appearance, duration and evolution of the urinary symptoms over time. Then patient's general state was evaluated, his/her ability for compliance in further treatment and rehabilitation. That followed by assessment of function of upper and lower limbs and upper limb dexterity (in evaluation of the ability for possible self-catheterization in the future). Anal tone, voluntary contractility and reflexes (including bulbo-cavernous reflex, cremaster and anal wink reflexes) were also evaluated. In patients with urine loss or urgency, a 3-day voiding diary was filled out. After the examination all information was added to patient's electronic health record (EHR) using terminology according the ICS standards.

Results: At our department in the time from 10.10.2020 until 10.02.2022 Neuro-urological examination was performed in 295 patients diagnosed with spinal cord tumors (n=213, of which 77 were intramedullary and 136 were extramedullary tumors) and degenerative processes (n=82) by single urologist using this particular technique. This technique (with some additional modifications) was also used in addition to patients in other departments at our hospital.

Interpretation of results: Neuro-urological examination technique, developed for neurosurgical patients showed up to be efficient in detailed evaluation of patients and potential for further recovery. It is aimed for patients undergoing neurosurgery and differs from classical urological examination. At the time of neuro-urological examination in patients hospitalized for planned neurosurgery there is already important information about localization and nature of the lesion gained during MRI, CT and other methods of neurovisualization. This information allows the examination to be more specific towards structures in micturition control pathway.

Concluding message: Neuro-urological examination routinely conducted at a very early stage within pre- and early post-neurosurgery period in high-risk patients (in whom voiding function is likely to be affected) may early awake much needed attention and provide duly prevention of further development of neurourological conditions.

Keywords: voiding dysfunction; neurourological examination; lower urinary tract function; postoperative recovery; urinary catheter use

115 SPECTRUM OF COMPRESSIVE SPINAL MASSES DIAGNOSED IN HIV-INFECTED PATIENTS MANAGED AT A SINGLE TERTIARY HOSPITAL

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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.

Aim: 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.

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.

Conclusion: 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.

Keywords: HIV; spine pathology; epidemiology

116 COMPARATIVE ANALYSIS OF KYPHOTIC DEFORMITY CORRECTION AND IMPLANT FAILURE IN PERCUTANEOUS PEDICLE SCREW FIXATION FOR THORACOLUMBAR BURST FRACTURES: INFLUENCE OF INCORPORATED SCREWS AT FRACTURE LEVEL

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Background: Most of the traumatic thoracolumbar injuries and fractures occur at the thoracolumbar junction (T11-L2). Considering significant prevalence of this condition, in currently there are not any evidence-based recommendations for best strategy as well as instrumentation methods. Thoracolumbar fractures can be treated surgically using a variety of methods, comprising anterior or posterior or open or minimally invasive, and posterior-anterior combination procedures. Therefore, a crucial consideration is required for the decision-making that which levels should be addressed for the instrumentation to achieve a successful recovery. The use of short- segment or long-segment tans pedicle screws for fixation in thoracolumbar fractures is still up for dispute at this time.

Objective: "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"

Methods: A prospective study included 56 patients which were fulfilling inclusion criteria of the study were added from the Neurosurgery Department of Punjab Institute Of Neuroscience. We divided into two groups. 28 patients were include in Short-Segment trans Pedicle Screws Fixation with Incorporated Screws in the Fracture vertebra (SSPF) (Group) Awhile 28 patients were include in percutaneous Long-Segment trans Pedicle Screws Fixation two above two blow (LSPF) (Group B). We evaluated the patient's pre-operative radiology, post-operative radiology and follow-up radiographs. The quantitative variables like cobb angle, and implant stability were analyzed.

Results: 28 patients (50%) underwent short segment and 28 (50%) underwent long-segment spine fixation. The mean ages of patients who were added in study were 31.5 ± 10.6 years. In this study there were total total 56 patients in which 38 patients 67.85% were males and 18 patients 32.14% were females. The fracture level Distribution there was in total 37 patients (67.07%) with L1 fracture, 15 patients (26.78%) with D12 fracture, 2 patients (3.57%) with D11 fracture and 2 patients (3.57%) with L2 fracture. Pre-operative Cobb Angle in Group A was 18.8±5 and in Group B 19.8 ±6.3 with p value 0.23 which was not significant statistically. Immediate post- operative Cobb angle was 6.4±3.4 in Group A and 7.3±3.7 in Group B with p-value was 0.66 which is not significant statistically. Three month follow up Cobb angle was 7.1±3.6 in Group A and 7.8±3.7was in group B with p -value was 0.78 which is not significant statistically. Six month follow-up Cobb angle was 7.9±3.6 in Group A and 8.4±3.8 in Group B with p - value was 0.502 which is not significant statistically.

Conclusions: Short-segment trans pedicle fixation with Incorporated Screws in Fracture vertebra can maintain cob angle which is being corrected as long-segment trans pedicle fixation for single vertebral level in thoracolumbar traumatic fracture injuries with good stability in term of implant failure

Keywords: Cobb Angle ; Thoracolumbar fracture ; Short-segment trans pedicle fixation ; Long-segment trans pedicle fixation

117 CORRELATION BETWEEN INTRAOPERATIVE NEUROPHYSIOLOGICAL MONITORING AND PATIENT NEUROLOGICAL STATUS AFTER SURGICAL TREATMENT OF INTRAMEDULLARY SPINAL CORD TUMORS

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1. Russian Federation, Moscow. National Medical Research Center for Neurosurgery named after Academician N.N. Burdenko

Intramedullary spinal cord tumors (IMSCTs) are rare, predominantly benign tumors arising from glial and ependymal cells, as well as cells of a different histological nature. They account for about 2% of all tumors of the central nervous systems and 20-30% of all spinal cord tumors, comprising the least common type of spinal neoplasms. The frequency of occurrence in the population averages 0.2-0.3 newly detected cases per 100, 000 people annually. Average patient age depending on the histological nature of the tumor and is approximately 30 - 40 years. Surgery remains the mainstay treatment for intramedullary spinal cord tumors. 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.

The aim of neurophysiologic intraoperative monitoring is to provided real-time data on functional integrity of neural structures in anesthetized patients, making surgery safer by detecting incipient neurological injury at a time when it can be avoided or minimized.

Keywords: intramedullary spinal cord tumor, intraoperative neurophysiological monitoring, somatosensory evoked potentials, motor evoked potentials, D-wave

118 LONG TERM FOLLOW UP (7 YEARS) OUTCOME OF BONE MARROW DERIVED STEM CELLS IN ACUTE COMPLETE SPINAL CORD INJURY - A RANDOMIZED PLACEBO CONTROLLED TRIAL

Rani R., Agrawal D.

Background: Due to lack of well-designed trials, there is no good evidence on the efficacy of stem cell in spinal cord injury.

Aims & Objectives: Long term follow up study of bone marrow derived stem cells in acute complete spinal cord injury.

Materials & Methods: In this prospective study over 3-year period (2012-2014), patients with acute (defined as within one week of injury) and complete (ASIA grade A) spinal cord injury were randomized to receive BMSC or placebo through intramedullary route intraoperatively at the time of spinal decompression & fusion. Institutional ethics approval was taken & informed consent was taken from all patients. Functional outcome was assessed using ASIA scale and SCIM score preoperatively at 7 year.

Results & Observations: A total of 13 patients were available for final analysis of which 6 were in stem cell group and seven in placebo group. Both groups were well matched in the M: F ratio, age and weight. Six patients (85%) had improvement by at least one grade in ASIA score in the stem cell group as compared to only one patient (16.5%) in the placebo group. ASIA sensory score improved from a preoperative mean of 124 (68-144) to 224 (156- 224) as compared static mean score of 115 in the placebo group. Absent SSEP waveform converted to abnormal waveform at 6 months in 3 patients (75%) in the stem cell group and one patient (16.7%) in placebo group. There was significant difference in the SCIM scores between the groups at last follow up. All patients in stem cell group reported improved bladder sensation and improved posture control as compared to nine in placebo group.

Conclusion: Patients treated with stem cell had significantly improved sensations (including bladder sensation) and posture control and there was also functional improvement in motor power in patients in the stem cell treated patients.

Keywords: Bone Marrow Derives Stem Cells, Complete Spinal Cord Injury, Safety, Intramedullary, Feasibility

119 EXPERIENCE IN THE USE OF MINIMALLY INVASIVE MICROSURGICAL DECOMPRESSION (MMD) IN SPINAL DEGENERATIVE MONOSEGMENTAL STENOSIS OF THE SPINAL CANAL OF THE LUMBOSACRAL SPINE

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Degenerative changes in the spine are a polyetiological process in which genetic

predisposition is one of the important factors. In elderly and senile people, degenerative changes in the spine are a natural involutive process that occurs in 95–98% of cases and, in some cases, lead to the formation of stenosis of the spinal canal. By the age of 65, signs of lumbar degenerative spinal stenosis, according to neuroimaging data, are found in 20% of the population and in 80% of people aged 70 and older. In the modern world, there is a tendency towards an increase in the proportion of people over 65, which is directly related to an increase in the life expectancy of the population and leads to an inevitable increase in the incidence of degenerative lesions of the spinal column in the population.

Treatment of spinal stenosis includes both non-surgical and surgical methods.

Conservative therapy is usually prescribed to patients in the initial stages of the disease, in the absence of severe neurological disorders and includes symptomatic pharmacotherapy, paravertebral and other blockade, physiotherapy and physiotherapy exercises. Despite the variety of nonsurgical treatments, a number of high-level studies have demonstrated that surgical decompression of the spinal canal in degenerative stenosis is more effective and superior to conservative therapy in selected patients. In the arsenal of a modern neurosurgeon, there are many ways to eliminate degenerative stenosis of the spinal canal, however, there is currently no single consensus on the choice of the optimal method of surgical treatment. In connection with the development of microsurgical techniques, navigation systems, endoscopic devices, minimally invasive methods of surgical correction of spinal stenosis are becoming increasingly common, among which the dominant positions are occupied by unilateral laminotomy with bilateral decompression (ULBD), minimally invasive transforaminal interbody fusion (MI- TLIF) and intralaminar / transforaminal endoscopic decompression of the spinal canal.

All of the above methods of surgical treatment of degenerative spinal stenosis have their advantages and disadvantages, and the aim of our study is to compare the effectiveness of minimally invasive microsurgical decompression and traditional decompression with stabilization.

Keywords: Lumbar stenosis, laminectomy, «over the top», minimal invasive decompression.

120 COMPARATIVE ANALYSIS OF OPEN TLIF AND WILTSE APPROACH IN TREATING SINGLE-LEVEL LUMBAR SPONDYLOLISTHESIS: A RETROSPECTIVE STUDY OF 600 CASES

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Object: The aim of this study is to compare the effectiveness of two different surgical approaches, open Transforaminal Lumbar Interbody Fusion (TLIF) and Wiltse TLIF, in the treatment of single- level lumbar spondylolisthesis in a group 600 patients retrospectively, also provide insights into the benefits and drawbacks of each approach and to identify which one may be more effective for patients with this condition.

Methods: This retrospective study included 600 patients with single-level lumbar spondylolisthesis who underwent fusion surgery at a single academic institution between January 2017 and January 2023. Patients were selected based on specific criteria and exclusion criteria. They were divided into two groups: conventional open group A (n = 300) and Wiltse approach TLIF group B (n = 300). Preoperative diagnostic tests were performed on all patients. The study was approved by the Ethics Committee and all patients provided consent. All surgeries were performed by the same surgeon.

Results: The fluoroscopy time for the Wiltse TLIF group was longer, The mean blood loss for the Wiltse TLIF group was less. Both techniques resulted in significant improvements in pain relief and functional disability, with no significant difference between the two groups in terms of their pre- or post-operative ODI scores , The Wiltse TLIF technique resulted in a significantly shorter hospital stay and had a lower rate of complications compared to the Open TLIF technique.

Conclusion: Both techniques had similar patient characteristics and resulted in comparable clinical outcomes, including postoperative pain, functional improvement, and complication rates. The Wiltse TLIF approach showed advantages in shorter surgical time, reduced blood loss, and shorter hospital stay. However, the conventional open TLIF approach had a shorter fluoroscopy time. Further studies with larger sample sizes and longer follow-up periods are needed to confirm these findings.

Keywords: TLIF; Wiltse TLIF; spondylolisthesis; retrospective.

121 PATIENTS FOLLOW-UP OF LUMBAR FORAMINAL STENOSIS AFTER ENDOSCOPIC SURGERY

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Object: The aim of this study is to evaluate the long-term outcomes of endoscopic surgery for lumbar foraminal stenosis in a cohort of patients, including changes in symptoms, functional status, complications and rates of reoperation.

The results of this study will provide valuable insights into the efficacy and safety of endoscopic surgery for lumbar foraminal stenosis and inform clinical decision-making for patients with this condition.

Methods: This retrospective cohort study aimed at evaluating the outcomes of endoscopic surgery in patients diagnosed with lumbar foraminal stenosis in a population of 100 patients who were diagnosed with lumbar foraminal stenosis and underwent endoscopic surgery at our institution between January 2018 and December 2021.

Results: The presented results are from a study evaluating the outcomes and complications of endoscopic lumbar foraminal decompression surgery for patients with lumbar foraminal stenosis. The study included 100 patients, with 50 male and 50 female, and the mean age was 48.2 years for males and 51.7 years for females. There were no significant differences in age and preoperative visual analogue scale (VAS) and Oswestry Disability Index (ODI) scores between the male and female groups.

Conclusion: Endoscopic surgery is a promising option for the treatment of lumbar foraminal stenosis. This study provides valuable information on the outcomes and complications associated with this procedure, and further research is needed to confirm these findings and compare endoscopic surgery to other treatment options for this condition.

Keywords: Foraminal stenosis, endoscopic spine surgery, spine surgery

122 SYRINGO-SUBARACHNOID SHUNT PLACEMENT USING A SMALL CATHETER: A CASE REPORT AND TECHNICAL NOTE

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Introduction: Syringomyelia is an etiologically diverse disorder caused by disturbance of physiological cerebrospinal fluid flow circulation. Enlargement of the fluid-filled cavity within the spinal cord often results in the clinical course of progressive neurologic deficit, such as sensory loss, pain, motor weakness, and autonomic dysfunction.

Objective: We report a case of a 51-year-old woman, who consulted with acute severe quadriparesis, loss of sensitivity and urinary and fecal incontinence. The patient was previously operated on for pituitary microadenomas by transsphenoidal transnasal route in 2017 and for Arnold– Chiari malformation in 2020. MRI of the brain and spine confirmed the diagnosis of cervical and thoracal syringomyelia, without any tumor recurrence, and good Chiari decompression.

Method: The patient was positioned in prone position, the head flexed and fixed. An intraoperative X-ray was used to confirm the C5-C6 level. A midline incision of the skin was done. After careful dissection of the soft tissue and muscle of the neck, a C5 and C6 laminectomies were performed. After opening the dura, a midline myelotomy was done and a syringo-subarachnoid shunt was placed, it was fixed with pial suture, the arachnoid and dura were then sutured.

Result: Postoperatively the patient had a significant and fast recovery, she was able to walk with aid on her 4th postoperative day. Postoperative MRI showed significantly reduced syringomyelia and adequate placement of the shunt. In her two weeks follow-up, the wound had healed great, she was walking on her own and had regained control of the sphincters.

Conclusion: Various techniques are utilized for the surgical treatment of syringomyelia with varying success. No technique has demonstrated superior results when compared to the others; therefore, various shunting procedures such as syringoperitoneal, syringopleural, and syringosubarachnoid are practiced. In this study, we presented a rare technique for shunting CSF into the subarachnoid space using a small catheter.

Keywords: syringomyelia, syringo-subarachnoid shunt, CSF, shunting, spinal surgery

123 RADIOLOGICAL COMPARISON OF SAGITTAL BALANCE OUTCOMES BETWEEN CERVICAL CORPECTOMY AND CERVICAL POSTERIOR FUSION

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Introduction: Anterior cervical corpectomy and fusion (ACCF) is frequently used for multilevel spinal cord compression causing myelopathy with cervical laminectomy with posterior fusion being a valid alternative. Very but few published studies compare the effect of both techniques on overall cervical sagittal balance.

Objective: To compare radiological outcomes of ACCF against posterior laminectomy and fusion in terms of segmental and global cervical alignments.

Methods: We performed a randomized study of radiological cervical alignment parameters (C0- 2, C3-7, indexCobbangles, T1slope, SVA)of2groupsofpatientsmatchedfortheirpre-operative C3-7 alignment. Between 2012-2017, patients with multilevel cervical compression were treated with either ACCF or laminectomy and fusion. Pre and post-operative neutral position cervical spine x-rays were used to measure the parameters, using the SECTRA® imaging software. All changes in different parameters are expressed as % of variation. We expressed kyphosis as negative angles and lordosis as positive angles.

Results: Twenty-eight patients were studied, equally divided between ACCF and laminectomy and fusion groups. In the ACCF group, there were 5 males and 9 females, with a mean age of 59, 7 years, and a mean of 1, 57 levels treated per patient (range of 1-3). In the laminectomy and posterior fusion group, the patients were equally divided between male and female, with mean age of 58, 9 years and mean of 2, 71 levels treated per patient (range of 1-4). Mean pre-operative C3-7 angle was 15, 55o (range of -9, 4o to 35, 9o) in the corpectomy group versus mean of 14, 81o (range of -15, 1o to 33, 5o) in the laminectomy group.

Regarding C3-7 sagittal alignment, a mean variation was found to be similar between the two procedures (mean of -29, 6% vs -31, 1% respectively). At the index level, the mean Cobb angle change was 41, 96% vs 32, 20%, respectively. As for the C0-2 functional unit, the two operations induced opposite variations (mean -1, 95% for corpectomy vs 6, 12% for posterior fusion). While there is a reduction in T1 slope, the effect was more marked in laminectomy and fusion (-14, 22% for posterior fusion vs -5, 95% for ACCF). In terms of SVA, corpectomy led to an increase of 49, 2%, whereas posterior fusion only increased by 4, 8%.

Conclusions: On global and index sagittal balance, the two techniques are equivalent, although there is a tendency for greater loss of lordosis in ACCF compared to laminectomy and fusion. Equally, the impact on SVA changes is greater with ACCF than with laminectomy and fusion, leading both to an increase in this parameter. None are free of effect on the C0-2 functional unit, with a tendency for kyphosis with ACCF and lordosis with laminectomy and posterior fixation. When choosing the appropriate decompression and fusion technique, pre-operative C0-2 angle and SVA should be strongly taken into account.

Key words: Sagittal Balance; Cervical Myelopathy; Corpectomy; Posterior Fusion

124 SURGICAL TREATMENT OF LARGE AND GIANT RECURRENT VESTIBULAR SCHWANNOMAS

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Background: Contemporary neurosurgery offers patients with vestibular schwannomas the best chance of cure and excellent functional outcome. Recurrent and previously irradiated tumors may, however, present difficulties for radical removal and preservation of involved cranial nerves.

Objective: To report the surgical difficulties and outcomes of a special group of patients with large and giant recurrent/residual vestibular schwannomas.

Methods: From a series of 714 vestibular schwannomas operated on by the senior author, 36 cases presented with large and giant recurrent/residual tumors. All previous surgeries were performed in other departments. The retrosigmoid-transmeatal approach was used in all cases with intraoperative monitoring of the cranial nerves.

Results: Tumors were classified as large (14 cases) when their diameter exceeded 3.5 cm and giant (22 cases) when their diameter exceeded 4.5 cm. There were 19 females and 17 males. The mean age was 33.7 ± 10.2 years. All patients had previously undergone surgery elsewhere. Hearing was lost in all cases, 15 had complete facial nerve palsy, 12 had trigeminal nerve deficits, 9 had cranial nerve IX and X palsy, and 12 had ataxic gait. Twenty-six patients undergone one surgery, 6 cases two surgeries, 3 cases three surgeries and one case four previous surgeries. Sixteen patients had hydrocephalus. Seven patients were submitted to radiotherapy. The mean postoperative follow-up was 4.9 years. Complete resection was achieved in all patients. One patient required two-stage surgeries due to brainstem edema caused by previous irradiation. The facial nerve was preserved in 16 (76%) of the 21 patients with preoperative facial function. Transient worsening of bulbar cranial nerves palsy occurred in 3 cases. Cerebrospinal fluid leakage occurred in 3 patients. There were no deaths, and the all tumors were histologically benign.

Conclusion: Surgical removal is the only treatment for these lesions. Total resection associated with a low morbidity rate is possible. Preservation of the facial nerve is difficult due to severe scar tissue. Patients submitted to previous surgery and irradiation are the most difficult cases.

Keywords: Vestibular Schwannomas, Recurrent, Residual, Giant, Large, Radiosurgery

125 MULTIDISCIPLINARY APPROACH TO THE AGGRESSIVE PITUITARY ADENOMAS: A CASE SERIES

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Introduction: Pituitary tumors are the second most frequent primary brain tumor, representing approximately 15% of all intracranial neoplasms. The classification of pituitary tumors has seen several changes in recent years. The 4th edition of the WHO Classification (2017) removed the entity of “atypical adenoma, as it failed to identify aggressive tumors. Instead, assessment of markers of proliferation, clinical parameters, such as invasive status and histological subtypes were recommended to identify tumors with aggressive potential. Thus, ‘aggressive’ pituitary adenomas need a multidisciplinary approach to be properly defined with clinical, radiological, histological and molecular markers in order to identify patients at increased risk of early recurrence or subsequent tumor progression. At present, no single marker or classification system of pituitary tumor aggressiveness exists, and clinically useful information in the literature is insufficient to guide diagnostic and therapeutic decisions. Treatment of patients with aggressive pituitary tumors is challenging since conventional treatments often fail, necessitating multiple therapies, including surgery, medical, radiotherapy, radionuclide receptor radionuclide therapy (PRRT) and even chemotherapy.

Methods: We selected 8 patients with a pituitary tumor with clinical features of aggressiveness. Patients underwent a complete endocrinological and neuroradiological pre-operative and post-operative study. Two were non-functioning, 2 prolactin-secreting, 3 adrenocorticotrophic hormone-secreting, and 1 a growth hormone-secreting adenoma.

RESULTS: The 8 patients underwent a total of 19 surgical procedures. At the first surgical procedure, gross total removal was achieved in none of the patients, whereas subtotal removal (>90% of tumor removed) was achieved in 5/8 cases and partial removal (<90% of tumor removed) in 3/8 cases. At first operation, 5/8 patients showed a Ki67 index <3% and 2/8 >3%; this information was not available for 1 patient. Postoperatively, all patients underwent radiation therapy. Three patients received chemotherapy with temozolomide. Three patients underwent peptide receptor radionuclide therapy. To date, 1 patient has died of tumor progression, and 2 patients are in a poor general condition. The remaining 5 patients are in a fair/good condition, without any major complaints.

Conclusions: Aggressive pituitary adenomas represent a specific and still underestimated entity, often diagnosed late. Clinical and neuroradiologic rapid progression is often the only marker of aggressiveness. Surgical debulking remains the first therapeutic option. Multidisciplinary management is mandatory to offer to these patients targeted therapeutic options.

Keywords: Aggressive Pituitary adenoma;Skull base Surgery; Multidisciplinary management

126 MINIMALLY INVASIVE SURGERY OF DEEP-SEATED BRAIN LESIONS USING TUBULAR RETRACTORS AND NAVIGATED TRANSCRANIAL MAGNETIC STIMULATION-BASED DIFFUSION TENSOR IMAGING TRACTOGRAPHY GUIDANCE

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Background: Surgical treatment of deep-seated brain lesions is a major challenge for neurosurgeons. Recently, tubular retractors have been used to help neurosurgeons in achieving the targeting and resection of deep lesions.

Objective: To describe a novel surgical approach based on the combination of tubular retractors and preoperative mapping by navigated transcranial magnetic stimulation (nTMS) and nTMS-based diffusion tensor imaging (DTI) tractography for the safe resection of deep-seated lesions.

Methods: Ten consecutive patients affected by deep-seated brain lesions close to eloquent motor/ language/visual pathways underwent preoperative nTMS mapping of motor/language cortical areas and nTMS-based DTI tractography of adjacent eloquent white matter tracts, including optic radiations. The nTMS-based information was used to plan the optimal surgical trajectory and to guide the insertion of tubular retractors within the brain parenchyma without causing injury to the eloquent cortical and subcortical structures. After surgery, all patients underwent a new nTMS-based DTI tractography of fascicles close to the tumor to verify their structural integrity.

Results: Gross total resection was achieved in 8 cases, subtotal resection in 1 case, and a biopsy in 1 case. No new postoperative deficits were observed, except in 1 case where a visual field defect due to injury to the optic radiations occurred. Postoperative nTMS-based DTI tractography showed the integrity of the subcortical fascicles crossed by tubular retractors trajectory in 9 cases.

Conclusion: The novel strategy combining tubular retractors with functional nTMS-based preoperative mapping enables a safe microsurgical resection of deep-seated lesions through the preservation of eloquent cortical areas and subcortical fascicles, thus reducing the risk of new permanent deficits.

Keywords: Deep-seated lesions; tubular retractors; nTMS; tractography; eloquent areas

127 PROMPT DIAGNOSIS WITH A MULTIDISCIPLINARY TEAM IS VITAL IN PITUITARY TUMOR MANAGEMENT

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Purpose: To report a case of a multi-disciplinary approach to expedited treatment of a patient with a pituitary adenoma.

Methods: Medical charts were reviewed, and information was collected.

Results: A 50-year-old Caucasian female presents to Neuro-ophthalmology per referral from endocrinology with decreased vision bilaterally and amenorrhea. Endocrinology testing displayed elevated estradiol with Follicle Stimulating Hormone (FSH) in the low-to-normal range. Further examination showed mildly decreased vision in the right eye of 20/20 and severely diminished vision in the left eye of "counting fingers." Extensive visual testing was conducted, including visual acuity and intraocular pressure, which was normal bilaterally, with pupillary reaction normal as well. Color vision was 11/11 in the right eye but completely diminished to 0/11 in the left eye. Visual field testing showed bilateral hemianopsia, denser in the left eye compared to the right. Ocular Coherence Tomography (OCT) portrayed decreased Ganglion Cell Layer (GCC) with bilateral hemifield defect and mildly decreased Retinal Never Fiber Layer (RNFL) bilaterally. Slit lamp examination was normal bilaterally. Fundus examination exhibited mild pallor of the optic nerve, left eye more than the right eye. A multi-disciplinary team, including radiology, neurosurgery, endocrinology, and ENT, was informed, and the patient was referred immediately to the radiologist. An MRI was conducted within 12 hours of the presentation that showed a 3.9 x 2.7 x 2.6 cm pituitary mass. The patient underwent neurosurgery within 36 hours of diagnosis. Neuro-ophthalmology follow-up one month later showed significant improvement in visual acuity from counting fingers to 20/20 bilaterally. Color vision improved to 11/11 bilaterally as well.

Conclusion: This case demonstrates the vitality of a well-organized multi-disciplinary team to ensure prompt treatment of patients with pituitary masses for the best long-term recovery of vision. A team consisting of a radiologist, endocrinologist, ophthalmologist, neurosurgeon, and ENT physician are necessary for favorable short-term outcomes.

Keywords: Pituitary Adenoma; Multidisciplinary; Ophthalmology; Neurosurgery; Radiology; Endocrinology

128 THE ENDONASAL ROUTE FOR ANTERIOR SKULL BASE MENINGIOMAS

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The most challenging task confronting modern meningioma surgery remains the selection of the most appropriate surgical approach, the latter greatly depending on location, anatomic tumor features, and relationship with critical neurovascular structures. Because of their benign nature, total removal leads to effective cure and it is claimed as the gold-standard treatment, being tailored upon the meningiomas biological behavior and the improvements in post-operative strategies. The endoscopic endonasal approach to anterior cranial fossa has proved to be both effective good outcomes and valid morbidity rates.

The endonasal endoscopic technique plays a a major role in granting so called maximum allowed resection for anterior skull base meningiomas. EEA allows the devascularization of the skull base blood supply before tumor resection, avoids brain and optic nerve manipulation, allows the intervening arachnoid plane to protect the vascular supply of the optic apparatus since the tumor is approached from below, allows early bilateral optic nerve decompression at the level of the optic canal.

Keywords: Endoscopy, skull base, endonasal surgery

129 INTRADURAL INTRAMEDULLARY TUMORS: REVIEW OF MOST RECENT CLASSIFICATION AND TREATMENT STRATEGIES. ANALYSIS OF NEW FACILITIES FOR SURGICAL RESECTION AND THEIR CORRELATION WITH EXTENT OF RESECTION AND POSTOPERATIVE NEUROLOGICAL DEFICITS

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Background: Intramedullary spinal cord tumors are rare lesions of the central nervous system. Anatomical, molecular and radiological features are well defined, but correct management should be tailored to each single case. Clinical and radiological follow-up is for the majority of the asymptomatic lesions while surgical treatment should be mandatory for symptomatic resectable lesions. Biopsy is reserved to intradural intramedullary malignant and infiltrative lesions or unresectable lesions. Nowadays the surgical treatment is facilitated by many technologies to reduce postoperative neurological deficits and extent the resection as far as possible still improving Quality of Life, PFS and OS.

Methods: We reviewed the classification of intradural intramedullary lesions based on the most recent WHO classification system. The standardized treatment for different histologies is presented. Furthermore, we performed a retrospective review of patients with intramedullary spinal tumor who underwent surgical resection from 2011 to 2023 in two different institutions. Clinical and radiological data, timing of symptom onset and IONM findings were analyzed. The IONM included somatosensory-evoked potentials (SSEP), motor-evoked potentials (MEP) and D-Wave whenever possible. We evaluated the outcome according to the Modified McCormick scale. We also evaluated the accuracy and relevance of surgical outcomes for each IONM (SSEP, MEP, D-Wave). Furthermore we describe the facility used at our institution during surgical resection and analyzed their impact on extent and safety of surgery.

Results: A total of 81 patients were included. A gross total removal was achieved in 53 cases. Neurological follow-up was assessed at 3 days, 3 and 6 months after surgery. Comparing the preoperative and 6 months follow-up clinical data: the modified McCormick scale showed a neurological stability for 52.63% of patients, a worsening of neurological status for 12.28% and an improvement for 35.08%. IONM presented high accuracy (sensibility of 100% and specificity of 95.65%) and significantly predicted postoperative permanent motor deficits ($P<0.0001$; AUC=0.978). D-Wave appeared to have significant greater predictive value than MEP and especially SSEP alone (0.967 vs 0.722 vs 0.542; $P=0.044$ and $P<0.001$ respectively). Furthermore the use of intraoperative navigation and image fusion technique, ultrasound and fluorescein help to achieve GTR with low incidence of postoperative neurological deficits.

Conclusions: The gold standard in the intramedullary lesion treatment is maximal safe resection with good neurological outcome, as shown in our patients. The use of IONM as much as other facilities is helpful in intramedullary tumors resection in order to minimize postoperative neurological deficits. Our analysis suggests that the use of D-Wave presents a statistically significant higher accuracy for predicting postoperative deficits than SSEP and MEP alone.

130 THE ROLE OF THE TREAT, EQUIP AND TRAIN MODEL IN DEVELOPING NEUROSURGICAL CAPACITY IN LMIC REGIONS: THE EXPERIENCE IN EAST, CENTRAL AND SOUTHERN (ECSA) REGION OF SUB SAHARAN AFRICA

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Global neurosurgery espouses the principle that neurosurgeons should aim to achieve a parity of standards of neurosurgical care across the world. In LMIC regions, access and delivery of such standards is significantly weak, and in many regions, unavailable. The Sub Saharan region is one such region. Following an evaluation, the author, in collaboration with like minded local and international colleagues have , over the results at two decades introduced a model that aims to avail treatment for neurosurgical cases through clinical missions, and steadily progress towards availing essential neurological equipment, while, in tandem, developing a curriculum for a neurosurgical training program. The latter, following, it's accreditation by the local regional college of surgeons (COSECSA), has had a significant impact on the neurosurgeon to population ratio and the provision of quality neurosurgery services in rural areas of sub Saha region of Africa. The author hopes that such an approach can be implemented in other LMIC regions globally.

Keywords: Global neurosurgery; LMIC regions; sub Saharan Africa; training program

131 THE INFLUENCE OF NIKOLA TESLA ON NEUROSURGERY

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Introduction: Nikola Tesla inventor and engineer who designed alternating current electricity. Although Nikola Tesla was not directly involved in neurosurgery or medicine, his work has facilitated the advancement of the field. Here, we describe the life of Nikola Tesla and his influence on neurosurgery.

Methods: A narrative review was conducted.

Results: Nikola Tesla was born in Smiljan in the Austrian Empire, now in present day Croatia, on July 10, 1856, the fourth of five children of an Eastern Orthodox priest and housewife. He became interested in experiments in early childhood and became interested in demonstrations of electricity by his physics professor at the Higher Real Gymnasium in Karlovac. Tesla then studied at technical schools in Prague and Graz due to his interest in engineering. He began working at the Continental Edison Company in Paris in 1882, then proceeding to move to the United States in 1884. In 1885, he left the Edison Company to start the Tesla Electric Light & Manufacturing Company. Tesla invented an induction motor that ran on alternating current, Tesla coil, induction motor, magnifying transmitter, Tesla turbine, Shadowgraph (X-rays), hydroelectric power plant, radio, neon lamp, and radio-controlled boat. Tesla's work has influenced neurosurgery profoundly. Regarding X-rays, Tesla irradiated his head, demonstrating the bony outline of his skull and its connection to the vertebral column, important as X-rays continue to be used for the workup of spinal pathologies and assessment of spine surgery. Tesla was the first to suggest that X-rays could be used therapeutically, a concept that has been adapted to stereotactic radiosurgery. In 1960, the unit of magnetic field strength was named the Tesla, now used for magnetic resonance imaging (MRI). The standard for MRI is 3T, while 7T is being introduced into clinical practice for characterization of neurosurgical pathologies, surgical planning, and neuronavigation.

Conclusions: Nikola Tesla was a visionary whose work has influenced the field of neurosurgery in the past and will continue to shape the future of neurosurgery moving forward.

Keywords: magnetic resonance imaging; neurological surgery; neurosurgery history; radiosurgery; X-ray

132 GLOBAL NEUROSURGERY PROJECTS – THINK GLOBAL ACT LOCAL

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Neurosurgery has seen significant advancements and progress, thanks to collaborative global neurosurgery projects that have facilitated the exchange of knowledge, skills, and resources among neurosurgeons worldwide, ultimately benefitting patients and enhancing the field as a whole.

World War I triggered a global transformation, with a significant focus on bolstering democracy and redefining economic relationships. In the realm of neurosurgery, the seeds of international collaboration were sown in Bern in 1931 during the inaugural international neurosurgical meeting. Just prior to the outbreak of World War II, Norman Dott proposed the establishment of European neurosurgical societies, foreshadowing a future of unity.

Following the ravages of World War II, the United Nations (UN) emerged as a beacon of hope, dedicated to upholding peace and fostering international cooperation. In the midst of economic hardships and post-war tensions, the vision for enhancing the neurosurgical community continued to evolve. In 1951, Herbert Olivecrona reached out to several European neurosurgeons, articulating the need for an international European society.

The World Federation of Neurosurgical Societies (WFNS) was founded in 1955, laying the groundwork for a momentous development. Inspired by this milestone, a trio of European neurosurgeons, Marcel David, Wilhelm Tönis, and Hugo Krayenbühl, conceived the idea of the First European Congress of Neurosurgery, which convened in Zürich in 1959. This marked the beginning of a new era.

The European Association of Neurosurgical Societies (EANS) was formally established in 1971, mirroring the aspirations of WFNS, as both organizations sought to foster advancements in neurosurgical care on a global scale.

Despite the turmoil brought about by the Yugoslav wars and NATO interventions in the Balkans, the need to confront global and regional challenges persisted. Thus, in 2012, the SouthEast Europe Neurosurgical Society (SeENS) was born, driven by a clear mission: to enhance neurosurgical care, education, and research in Southeast Europe through the promotion of knowledge exchange and collaboration among neurosurgeons in the region. SouthEast European neurosurgeons exemplify the concept of thinking globally while acting locally, working in unison to broaden horizons for the betterment of patients and the recognition of their field in the modern world. Even amidst the ongoing conflicts in Ukraine, the advancement of the neurosurgical community must not waver. Building upon a robust foundation of tradition and expertise, and guided by contemporary achievements, trends, and innovations, we strive for a future in neurosurgery and neuroscience that transcends geopolitical boundaries. Our aim is to construct bridges of knowledge and mutual understanding that span disciplines, institutions, individuals, and generations, fostering unity and progress on a global scale.

Keywords: Neurosurgery, History, Global Perspectives, Projects, Development

133 NEUROSURGICAL EDUCATION IN EGYPT AND AFRICA

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Introduction: Africa still significantly lags in the development of neurosurgery. Egypt, located in North Africa, is well developed in this specialty, with the largest number of neurosurgeons among all African countries. This article provides insight into neurosurgical training in Egypt, the challenges African neurosurgeons are facing, and the requirements needed to enhance neurosurgical education and build up the required neurosurgical capacity in Africa.

Methods: The information presented in the current work was collected from databases of the Egyptian Society of Neurological Surgeons and the World Federation of Neurosurgical Societies.

Results: There are two types of neurosurgical certification in Egypt. The first type is granted by the universities (MD), and the second is awarded by the Ministry of Health (Fellow of Neurosurgery). The program in both types ranges from 6 to 9 years. The number of qualified neurosurgeons in Egypt constitutes one-third of the total number of African neurosurgeons. There is a significant shortage of neurological surgeons in Africa, and the distribution is entirely unbalanced, with the majority of neurosurgeons concentrated in the North and South regions. The most important challenge facing neurosurgery in Africa is lack of resources, which is considered to be the main obstacle to the development of neurosurgery.

Other challenges include the limited number of neurosurgeons, lack of training programs, and lack of collaboration among the different regions.

Conclusions: Proper collaboration among the different regions within the African continent regarding neurosurgical education will enhance African neurosurgical capacity and make neurosurgery an independent specialty. The definite functional polarity among different regions, regarding both the number of qualified neurosurgeons and the neurosurgical capacity, is an important factor that could help in the development of neurosurgery in this continent.

Keywords: Africa; Education; Egypt; Neurosurgery; Training

134 COMPLICATIONS IN PERIPHERAL NERVE SURGERY

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Peripheral nerve surgery is a rapidly evolving field, offering promising therapeutic options for a range of neurological disorders and traumatic injuries. However, this progress has brought about the potential for various complications, which necessitates a thorough understanding of their occurrence, prevention, and management. This paper presents a comprehensive review of the literature on complications related to peripheral nerve surgery, offering insights into their frequency, causative factors, and outcomes. Additionally, the paper includes a series of illustrative cases highlighting diverse complications encountered in clinical practice. These cases underscore the importance of vigilance, meticulous surgical technique, and appropriate postoperative care to minimize complications and optimize patient outcomes in the realm of peripheral nerve surgery. By amalgamating empirical evidence with real-world clinical scenarios, this paper aims to contribute to the collective knowledge base, fostering improved patient care and safety in this dynamic field of neurosurgery.

Keywords: Neurosurgery, Peripheral Nerves, Complications, Peripheral Nerve Injuries, Postoperative Care

135 HUMAN NEUROPHYSIOLOGY OF UPPER MOTOR NEURON PARALYSIS

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There are numerous structures within the cortex, subcortex, brain stem, and spinal cord, as well as complex interconnections between them via cortico-subcortical, corticobulbar, sub corticobulbar, corticospinal and bulbospinal descending pathways. All these morphologic and functional complexities of the central nervous system are involved in motor control and are referred to as upper motor neuron.

From clinical or electromyographic point of view, the upper motor neuron syndrome is also complex neurologic entity, and it is unrealistic to expect that electromyography can simplify diagnostic or therapeutic problems of this neurologic syndrome unless one more specifically defines what type of upper motor neuron syndrome is under electromyographic evaluation. This study is restricted to upper motor neuron syndromes owing to chronic effects of spinal cord injury (SCI). In this context, we have studied three functions of the upper motor neuron:

(1) the degree of preservation of deterioration of volition activity, (2) the effects of remote muscle contraction on paretic or paralyzed muscles, and (3) characteristic features of stretch and withdrawal reflexes.

Patients with clinically complete paralysis were tested for residual and sub clinical manifestation of upper motor neuron functions and to document the presence of manifestation of upper motor neuron functions and to document the presence of minute or gross volution motor unit activation when it was not possible to differentiate with certainty, on a clinical basis, the segmental super segmental origin of such abnormal movements.

Various degrees of deterioration of volition activity were contrasted with the effects of remote muscle contraction on paretic or paralyzed muscles. Systematic sEMG recordings of these activities make it possible to describe patterns of neuron control over a wide range of impairments.

Keywords: Upper Motor Neuron; Paralysis

136 LUMBAR SPINAL STENOSIS: WHEN TO DECOMPRESS OR FUSE?

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In patients with lumbar spinal stenosis (LSS) and no sign or symptoms of instability and predominant leg pain, decompression alone is recommended. In patients with stenosis and stable spondylolisthesis, fusion is not mandatory and decompression alone is suggested.

Unstable spondylolisthesis with symptoms may require fusion. There is no consensus if the main complaint is mechanical axial low back pain, which is more than leg pain, the patient may benefit from a fusion surgery.

Patients with LSS and loss of sagittal balance, if symptomatic, may benefit from decompression, fixation, and deformity correction surgery. Fusion may be advisable in patients who undergo bilateral facetectomy of more than 50% and bilateral discectomy. Facet joint effusion alone is not proven to correlate with stability.

Nonsurgical treatment for LSS may still be a good option for many patients. Decompression is the basis of surgical treatment of lumbar spinal stenosis. Indication of surgery for spinal stenosis are mostly (>90%) relative (claudication) and to increase the quality of life. Unilateral approach, bilateral decompression is currently most popular surgery. But its value is not validated yet. MIS techniques for spinal stenosis have some advantages. Fusion is an option, especially when spondylolisthesis or instability are present, but indications remain controversial. In degenerative lysthesis decompression without fusion is possible.

This talk will discuss the problems of lumbar spinal stenosis surgery and try to give more precise criteria for patient selection.

Keywords: Lumbar spine; spinal stenosis; fusion; pedicle screw fixation

137 THE PIVOTAL ROLE OF INTRAOPERATIVE NAVIGATION IN FIXATION OF CRANIOVERTEBRAL JUNCTION MALFORMATIONS

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The craniovertebral junction (CVJ) represents a critical anatomical region connecting the skull and the cervical spine. It is a biomechanically complex articulation, that represents the most dynamic area of the cervical spine.

Craniovertebral junction malformations (CVJM) comprise a wide spectrum of diseases, that can be divided into congenital, developmental, or acquired forms. Often, multiple forms can coexist together, posing significant challenges due to their intricate anatomy. Since the publication of Goel and Laheri landmark paper in 1994, the surgical treatment of CVJ pathologies has undergone significant development and changes. CVJM may distort the usual anatomical landmarks, thus misleading the surgeon, and making fixation of this region complex and dangerous for such patients.

Over the years, significant innovations in the technological field have revolutionized the treatment of CVJM. One such notable advancement is the integration of intraoperative neuronavigation systems. Our intention is to shed light on the pivotal role of intraoperative neuronavigation in the posterior fixation of CVJM. We reported our experience and a comprehensive review of the literature, in which we focused on the feasibility and safety of the treatment by customizing screw fixation to overcome the patient's anatomical barriers.

Keywords: Craniovertebral junction malformation, Navigation, Intraoperative imaging, Surgical safety, Posterior fixation

138 POSTERIOR LUMBAR SPINE FUSION WITH EXPANDABLE INTERBODY IMPLANTS: SAFE AND EFFECTIVE AT THE LUMBO-SACRAL LEVEL

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The intent of expandable interbody fusion devices is to achieve and maintain sagittal and coronal segmental correction and fusion through anterior, lateral and posterior portals. These devices are the culmination of interbody fusion development from static biconvex or cylindrical devices to static lordotic cages, to the more advanced multidirectional expandable devices. While the lateral approach has gained favor and utility with these devices, the static lordotic device through the anterior approach has been favored at the lumbosacral level to achieve desired segmental lordosis. In part, this has evolved from the fact that static or expandable posterior devices could only achieve 12 to 18o of lordosis. Novel posterior device technology provides lordotic expansion of 22o or greater with delivery through an MIS portal.

We present clinical cases ranging from degenerative disc collapse to Grade 1 and 2 spondylolisthesis at the lumbosacral level treated with a novel expandable interbody fusion device from the posterior MIS or mini open approach. Desired segmental and global lumbar lordosis is achieved and maintained at 18-24 months.

Conclusion: Expandable interbody fusion devices may be safely and effectively employed through the posterior approach for lumbosacral degenerative pathology with correction and fixation through a single incision using both open and MIS approaches.

Keywords: Expandable Lumbar Interbody Fusion Device; MIS

139 Efficacy of surgical treatment for degenerative cervical myelopathy

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Introduction. Treatment options for degenerative cervical myelopathy (DCM) are the topic for discussion due to lack of controlled randomized prospective study. Also, the natural history of DCM is unpredictable and efficacy of surgical decompression is still controversial.

Methods. Fifty nine patients with symptomatic DCM were enrolled in this single center prospective study, at the end of follow-up period of 12 months, 50 patients were analyzed. All patients were operated, surgical decompression was performed by anterior or posterior surgical approach. Outcome evaluations were obtained preoperatively and 12 months postoperatively by using outcome measures: the modified Japanese Orthopedic Association (mJOA) scale, the Nurick score and the Neck Disability Index (NDI). Functional recovery ratio was calculated postoperatively by using the formula of Hirabayashi.

Results. According to our results, significant improvements were detected in all outcomes variables (mJOA score, Nurick score and NDI). Also, statistically significant improvement was observed in all three category of patients according to preoperative mJOA score (mild, moderate, severe). Twenty three (46%) patients had satisfied functional recovery, while twenty seven (54%) had unsatisfied functional recovery rate.

Conclusion. Surgical treatment of DCM is a very effective and resulted in a significant improvement in all outcomes measures for a 1 year follow-up period.

140 EVOLUTION AND VERSATILITY OF LATERAL MIS APPROACHES TO THE LUMBAR SPINE

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Lateral MIS approaches to the spine are relatively modern surgical approaches, developed in the last two decades. Their introduction has meant for the surgeons learning specific anatomical concepts like superficial nerves, localization of the plexus within the psoas, and vascular structures.

Surgical technique has been standardized thanks to the work of some groups like AOSpine MIS Task Force, and standardization has allowed easiest learning, development of educational tools (like specific 3D models), and comparative studies. Some crucial points in the lateral surgical techniques are positioning of the patient, perfect orthogonal XRays images and neuromonitoring. Intraoperative neurophysiology is essential to prevent neurological complications (and has led to a significative decrease in the rate of these, from around 25% in the first publications to less than 3% of permanent neurological lesions nowadays). We consider neuromonitoring mandatory in transpsoas surgeries, and recommend the use of local nerve mapping, continuous free EMG monitoring, transcranial evoked motors and somatosensory evoked potentials during surgery. Main indications for lateral MIS approaches are adult deformity and adjacent level disease, but any kind of instability associated with central or foraminal canal stenosis can be addressed with these techniques.

The main advantages of transpsoas and prepsoas approaches are coronal correction, sagittal balance improvement, high fusion rates (more than 90%) and indirect decompression, and there are many publications showing it. The main disadvantages of transpsoas approach are neurological complications, inability to provide decompression in some cases and ability to provide enough lordosis. For prepsoas approach the main risk is vascular injuries (up to 1%) and visceral injuries (up to 4.7%). Lateral transpsoas can be used as stand alone technique, but usually posterior fixation is recommended (3.8% to 13.5 % of revision rate in stand alone LLIFs). Options to increase lordosis are opening the anterior ligament (anterior release technique), hyperlordotic cages and expandable cages, but there is still no definitive evidence showing the ability of these to improve lordosis. In long constructions, an alternative to stages surgeries (lateral cages one day and posterior fixation other) is single position in lateral or in prone position. 3D Navigation and robotics can be good tools helping to put the screws in lateral position.

As take home messages for lateral approaches, main points would be:

- Patient selection;
- Meticulous preoperative planning (the strongest independent predictor of complications is the total number of levels operated per patient; each additional level increases 59% the complication rate);
- Intraoperative neurophysiology in LLIF;
- Try not to break the table and try to minimize surgical time with open retractor;
- Avoid use of monopolar in the approach;
- Don’t violate endplates;
- Use new technology when possible (navigation, robotics, expandable cages).

Keywords: lateral; LLIF; prepsoas; MIS; lumbar

141 REVASCULARIZATION THERAPIES IN ACUTE STROKE PATIENTS TREATED WITH DIRECT ORAL ANTICOAGULANTS

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Direct oral anticoagulants (DOACs) are first line therapy in primary and secondary stroke prevention in patients with nonvalvular atrial fibrillation (NVAF). Number of patients with DOAC initiation in clinical practice is rising rapidly. Despite the high efficacy and safety of DOACs, 1-2% of patients suffer acute ischemic stroke (AIS).

The gold standard treatment for patients with AIS is recanalization therapy, which includes intravenous thrombolysis (IVT) and mechanical recanalization (MeR). Treatment with IVT is currently possible only in dabigatran-treated patients after reversal of anticoagulation with antidote, or in other DOAC-treated patients when specific coagulation tests prove the absence of anticoagulation effect. In the absence of other options, most patients who suffer AIS on DOAC therapy are treated with MeR, which is only possible in rare centers, and only when large vessel is occluded. However, evidence is limited, and international guidelines contain heterogenous recommendations. In the presentation real life data on AIS in patients on DOACs, eligible for IVT, is presented, including guidelines.

Keywords: DOACs, acute ischemic stroke

142 EPILEPSY ASSOCIATED WITH CEREBRAL CAVERNOUS MALFORMATIONS: SURGICAL MANAGEMENT AND OUTCOME

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Background: The most frequent symptom of cavernous malformations of the brain is seizure, which is seen in up to 80% of cases. The risk of seizure onset in patients with supratentorial cavernous malformation is around 2% per year.

Aim: To assess the effectiveness and safety of surgical treatment of supratentorial cavernous malformations which present with seizures.

Methods: A total of 90 patients with supratentorial cavernous malformations underwent surgery in Uzhhorod Regional Centre of Neurosurgery and Neurology during a period of 13 years (since 2010). The retrospective analysis was performed assessing the outcome of 67 patients who presented with seizure (74%). Male to female ratio was 6:7. Mean age of the patients was 30.6 years. Localization of the lesions: frontal lobe — 54%, temporal lobe and insula — 30%, parietal lobe — 12%, occipital lobe — 4%. Majority of the patients had complex partial (46%) and secondary-generalized seizures (42%). Preoperative assessment was tailored to confirm that cavernoma is a primary cause of epilepsy — EEG and the analysis of seizure semiology by our epilepsy team performed in all patients. Intraoperative neurophysiological monitoring, neuronavigation and intraoperative ultrasound were used in order to minimize the invasiveness of the surgery and the risk of new neurological deficit. Resection of a cavernoma was supplemented by the removal of perifocal hemosiderosis in most cases (87%). MRI was performed routinely 3 months after surgery and patient was examined on follow-up visit after the MRI.

Results: Patients were divided into two groups based on epilepsy duration: rare seizures (less than 10 seizures before surgery) — 46%, and frequent seizures (>10 seizures before surgery) — 54%. Outcome was assessed according to Engel scale: Engel I - 21 — 81%, Engel II — 13%, Engel III — 4%, Engel IV — 2%. The subgroup analysis showed that excellent outcome was achieved in patients with rare seizures — 100% seizure-free (Engel I). Further analysis showed that unsatisfactory result (Engel III and IV) was achieved in cases with secondary-generalized seizures and drug-resistant epilepsy. Age, sex and localization of the lesion did not affect the outcome. On 90-day follow-up visit none of the patients showed signs of neurological deficit and MRI confirmed complete resection of all lesions.

Conclusions: Surgical treatment of epileptogenic cavernous malformations is safe (no morbidity or mortality) and effective (Engel I+II — 94%). Negative prognostic factors are long duration of epilepsy before surgery, secondary-generalized seizures and drug-resistant epilepsy.

Keywords: Cavernoma, Epilepsy, Outcome

143 ROLE OF FEMALE HORMONES IN INTRACRANIAL ANEURYSMS

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Introduction: Intracranial aneurysms (IAs) posing a significant risk of rupture and potentially life-threatening consequences. The pathophysiology of IAs is complex, and emerging evidence suggests that female hormones play a crucial role in their development and disease course. This overview aims to explore the relationship between female hormones and intracranial aneurysms, examining their influence on aneurysm formation, growth, and rupture.

Results: Research has shown that female hormones, particularly estrogen and progesterone, have a multifaceted impact on the cerebral vasculature. Estrogen, for instance, exerts a protective effect on the endothelial cells lining the blood vessels, promoting vasodilation and maintaining vascular integrity. Furthermore, estrogen has been linked to the upregulation of endothelial nitric oxide synthase, leading to enhanced nitric oxide production, which, in turn, helps to maintain vascular tone and reduce inflammation.

However, the protective effects of estrogen seem to diminish after menopause, resulting in an increased incidence of IAs in postmenopausal women. During menopause, there is a significant decline in estrogen levels, leading to adverse vascular changes, including increased endothelial dysfunction and oxidative stress, which may contribute to IA formation and growth. On the other hand, progesterone appears to have a more complex role. While some studies suggest that progesterone might have a protective effect similar to estrogen, others propose that it could have detrimental effects on the cerebral vasculature, potentially contributing to aneurysm formation and rupture.

Conclusion: The interplay between female hormones and intracranial aneurysms is a complex and intriguing area of research. Estrogen appears to confer a protective effect on cerebral blood vessels, reducing the risk of aneurysm development and rupture. However, this protection diminishes after menopause due to declining estrogen levels. The role of progesterone remains less clear, with conflicting evidence on its influence.

Understanding the intricate relationship between female hormones and intracranial aneurysms is essential for developing targeted preventive and therapeutic strategies. Further research is warranted to unravel the molecular mechanisms underlying hormone-induced vascular changes and to explore potential hormone-based treatments for individuals at risk of or diagnosed with intracranial aneurysms. Ultimately, elucidating the role of female hormones in IAs could lead to improved patient outcomes and a better understanding of the broader impact of hormonal fluctuations on cerebrovascular health.

Keywords: Aneurysm, Female hormons, cerebrovascular

144 COMPLICATIONS AFTER ANGIOGRAM-NEGATIVE SUBARACHNOID HAEMORRHAGE: COMPARATIVE STUDY OF PRETRUNCAL AND NONPRETRUNCAL HEMORRHAGE PATIENTS

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Introduction: Subarachnoid haemorrhages (SAH) of unknown aetiology usually have a mild clinical presentation, favourable outcome and low complication rate.

Objective: The aim of this study was to analyse the complications in two forms of angiogram- negative spontaneous SAH: pretruncal (PNSAH) and nonpretruncal (NPNSAH).

Methods: The study group involved 18 patients with PNSAH and 16 patients with NPNSAH. CT scan was done within 72 hours from bleeding. All patients underwent four-vessel cerebral angiography. Repeat angiography was performed in five PNSAH and all NPNSAH patients.

Results: Twenty-nine patients were in grade I or II of the Hunt-Hess Scale (17 PNSAH and 12 NPNSAH). There was one case of rebleeding (NPNSAH patient), 10 cases of transient acute hydrocephalus (4 PNSAH and 6 NPNSAH). Cerebral vasospasm visualized by angiographies in two NPNSAH patients was local and mild, but was not found in PNSAH patients. Acute electrocardiography changes were found in 19 patients (significantly more frequently in NPNSAH than in PNSAH, 12 and 7 patients, respectively; $p = 0.037$).

Conclusion: Cardiac problems following these types of SAH are more frequent than expected, and therefore cardiac monitoring is necessary.

Keywords: angiogram-negative subarachnoid haemorrhage; complications; electrocardiograph

145 REDUCTION TECHNIQUES FOR BASILAR INVAGINATION

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Treatment of basilar invagination has been simplified after introduction of reduction techniques. Reducibility is not a new concept. Its detailed description was given by Menezes. However, the reducibility concept has evolved by years. Previously used preoperative cranial traction cannot achieve a good reduction even in children. Instead, intraoperative traction under general anesthesia, or transoral odontoid release, or posterior intra-articular release can help reduction more effectively. Goel's technique of placing spacers between the atlanto-axial joint is also effective in reducing the instability and especially withdrawal of the odontoid process from foramen magnum.

Fusion of C1 arch and odontoid process is a common reason of irreducibility. In those cases, anterior release, and posterior occiput to C1/C2 fixation (Wang et al 2017, Achalare et al 2021) or posterior osteotomy (Salunke 2018, Liu et al 2021) can be recommended.

Reduction methods for basilar invagination can be described in the following divisions: (1) Preoperative cranial traction, (2) Intraoperative traction under general anesthesia, (3) Posterior intra-articular release (Goel), (4) Cantilever reduction and posterior occipitocervical fixation, (5) Posterior osteotomy (Salunke 2018, Liu et al 2021), (6) Anterior release and posterior reduction either by transoral atlantoaxial eelease (Wang et al 2017, Achalare et al 2021) or by retropharyngeal release.

In case a reduction is not possible, a transoral odontoidectomy and posterior occipitocervical fixation will be necessary. This talk reviews all these options and discusses pros and cons.

Keywords: basilar invagination; craniocervical junction; reduction; atlanto-axial fixation

146 PITFALLS IN THE DIAGNOSIS AND MANAGEMENT OF INTRAMEDULLARY TUMORS

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Intramedullary spinal cord tumors at times may cause significant difficulties in differentiating between inflammatory and vascular lesions. 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 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. 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.

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.

Keywords: intramedullary tumors; inflammatory; ependymoma; astrocytoma; multiple sclerosis; transverse myelitis

147 The Anjali spinal navigation technique: Simplifying Complex spine Surgery

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The Anjali Spinal Navigation Technique was developed in KVM Hospital by Dr Avinash Haridas in 2022. This is an innovative new operative spinal navigation technique that uses intra-operative 3D-CT.

Spinal pedicle screw fixation using the traditional C-arm guided technique is associated with misplaced screws, even when done by the most experienced spinal neurosurgeons.

Pedicle screws with medial breach of the pedicle can cause dural tear, CSF leak and pseudo-meningocoele, nerve root, cauda equina or spinal cord injury depending on the level, thereby causing neurological deficits, paralysis with neurogenic pain, numbness in the lower limbs; bowel, bladder or sexual dysfunction.

Superior and inferior pedicle breach can irritate or injure the nerve roots causing lower limb neurogenic pain, numbness, weakness or paralysis in the corresponding myotome. Lateral pedicle wall violations can cause visceral injury, vascular injury or ureteric injury with devastating consequences.

Anterior vertebral body breach can cause vascular injury (venous or arterial), visceral injury, lung injury or internal organ injury which can be potentially fatal. Most dangerous of all is vascular injury as it can cause postoperative refractory hypotension and sudden death.

Robotic neuro-navigation guided pedicle screw insertion and traditional Neuro-navigation guided pedicle screw insertion both aim to achieve nearly 100% accurate placements of pedicle screws without pedicle wall breach. Both techniques are still dependent on intra-operative C-arm or CT scan to check the intra-operative accuracy of the screw placement. The vast majority of neurosurgery centres around the World do not have access to Neuro-navigation and only an extremely few elite centres around the World have access to the very expensive Robotic spine surgery machine with inbuilt Neuro-navigation.

However, almost all Neurosurgery centres around the World have access to a diagnostic CT scan. By using Intra-operative CT scan with a freely available 3D CT scan software, the author pioneered a new technique called the 'Anjali Technique', making it possible to attain Robotic Neuro-navigation level precision in placement of the pedicle screws. Best of all, this technique has zero financial commitments by already cash strapped centres who are not able to afford expensive Neuro-navigation machines.

Conclusion: The 'Anjali technique' enables the neurosurgeon to safely place pedicle screws with confidence and avoids all the unnecessary dangerous complications associated with traditional C-Arm guided surgery.

Keywords: spine navigation, Anjali technique

148 GLOBAL BRAIN METASTASES MANAGEMENT STRATEGY

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Introduction: Brain metastases are ten times more present than primary primitive brain tumors. Diseased lungs, breasts, urinary and digestive tract as well as melanoma of the skin, are increasingly treated by neurosurgeons due to their dissemination and creation of secondary deposits in the brain.80% of metastases are localized in the hemisphere, 15% are localized at the cerebellar level and 5% at the bone level.

Method: Principles in treating metastases in our department is operative, radio therapy and treatment of gamma knife. Operational treatment when metastases is solitary, primary disease is in remission, no disease progression and general condition of patients is good, Karnovski above 80.The principle of radiation of the whole brain is applied for more metastases, in a worst status, Karnovski index is 60-80.Gamma knife is used in multiple metastases when primary process is in remission and Karnovsi above 80.

Conclusion: Operative treatment of metastases we used when patients have one change that endangers the patient's life, Karnovski index over 80.Gama knife therapy for more metastases, when primary process is in remission and Karnovski above 80.

Keywords: Brain metastasis, Gamma knife, Radiation treatment, Operational treatment of metastasis

149 RESECTION OF INSULAR GLIOMAS: HOW USEFUL IS NAVIGATED INTRAOPERATIVE 3D-ULTRASOUND?

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Introduction: Resection of insular gliomas is still challenging, predominantly due to the risk of iatrogenic injury to lenticulostriate arteries (LSAs). Intraoperative localization using conventional neuronavigation can be difficult due to brain shift, and anatomical landmarks are often insufficient for the exact location of LSAs on their whole trajectory. In 2016, we introduced a novel method of intraoperative LSAs visualization by navigated 3D-ultrasound (3D-US) power Doppler mode. However, our initial published results were achieved using a 3D-US system equipped with a scanner that is already out-of-date. To the best of our knowledge, no data regarding the identification of LSAs using current modern 3D-US systems were reported. In our lecture, we aim to present our initial experience with utilization of a high-end 3D-US for LSAs identification.

In addition, we also aim to present our experience with utilization of intraoperative 3D-US for insular glioma tissue visualization in order to deal with the problem of the macroscopic similarity between glioma-infiltrated and normal brain tissue.

Methods: A high-end 3D-US system (ultrasound bk5000, BK Medical Aps, Herlev, Denmark integrated with neuronavigation Curve, Brainlab AG, Munich, Germany) was used for LSAs as well as for glioma tissue visualization during resections of insular gliomas. Pitfalls of ultrasound imaging were analyzed.

Results: In all insular glioma cases, 3D-US power Doppler distinctly displayed LSAs; the distance between the bottom of the resection cavity and LSAs could be evaluated intraoperatively. However, very slow and repeated scanning was often necessary, in order to avoid flash artifacts. To evaluate the ability of 3D-US to depict LSAs, an ongoing prospective study comparing the quality of LSAs visualization with the standard 3T MRI contrast-enhanced time-of-flight sequence has been started at our department in 2021.

During utilization of 3D-US for identification of glioma-infiltrated tissue, ultrasound artifacts (mostly hyperechoic acoustic enhancement artifacts) also represented a major pitfall. Methods enabling reduction of ultrasound artifacts were often necessary in order to achieve comprehensible 3D-US images.

Conclusions: Our initial experience indicates that while adhering to all standard precautions in order to prevent injury to LSAs, neurosurgeons should be aware that navigated 3D-US power Doppler may enable direct LSAs visualization, which may serve as a "warning sign" in considerable number of insular glioma cases. Additionally, while intraoperative 3D-US is undoubtedly a useful imaging modality during resection of insular gliomas, dealing with some pitfalls, predominantly various artifacts, is necessary to obtain comprehensible 3D-US images.

Keywords: Intraoperative ultrasound; Insula; Glioma; Lenticulostriate arteries; Artifact

150 PREOPERATIVE [11C]METHIONINE PET TO PERSONALIZE TREATMENT DECISIONS IN PATIENTS WITH LOWER-GRADE GLIOMAS

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Background: PET with radiolabeled amino acids is used in the preoperative evaluation of patients with glial neoplasms. This study aimed to assess the role of [11C]methionine (MET) PET in assessing molecular features, tumor extent, and prognosis in newly diagnosed lower- grade gliomas (LGGs) surgically treated.

Methods: One hundred and fifty-three patients with a new diagnosis of grade 2/3 glioma who underwent surgery at our Institution and were imaged preoperatively using [11C]MET PET/CT were retrospectively included. [11C]MET PET images were qualitatively and semi-quantitatively analyzed using tumor-to-background ratio (TBR). Progression-free survival (PFS) rates were estimated using the Kaplan-Meier method and Cox proportional-hazards regression was used to test the association of clinicopathological and imaging data to PFS.

Results: Overall, 111 lesions (73%) were positive, while thirty-two (21%) and ten (6%) were isometabolic and hypometabolic at [11C]MET PET, respectively. [11C]MET uptake was more common in oligodendrogliomas than IDH-mutant astrocytomas (87% vs 50% of cases, respectively). Among [11C]MET-positive gliomas, grade 3 oligodendrogliomas had the highest median TBRmax (3.22). In 25% of patients, PET helped to better delineate tumor margins compared to MRI only. In IDH-mutant astrocytomas, higher TBRmax values at [11C]MET PET were independent predictors of shorter PFS.

Conclusions: This work highlights the role of preoperative [11C]MET PET in estimating the type of suspected LGGs, assessing tumor extent, and predicting biological behavior and prognosis of histologically confirmed LGGs. Our findings support the implementation of [11C]MET PET in routine clinical practice to better manage these neoplasms.

Keywords: [11C]methionine PET; brain tumors; lower-grade gliomas; prognosis; surgery

151 LOW GRADE GLIOMA: NEW TREATMENT APROUCH

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Diffuse infiltrating low-grade gliomas are classified as WHO grade 2 tumors and include oligodendrogliomas and astrocytomas. . In 2016, the WHO updated its classification of primary brain tumors to include molecular characterization, now defining tumors both on phenotype and genotype. Oligodendrogliomas are now also defined as having both an isocitrate dehydrogenase (IDH) gene family mutation and combined whole-arm losses of 1p and 19q. Astrocytomas are characterized by prominent glial fibrillary acidic protein processes, typically also have mutations in IDH, but have intact 1p and 19q chromosomes. They are relatively rare tumors, accounting for only 5% of all primary brain tumors and 15% of all gliomas. The most typical presentation is seizure. Sometimes they are discovered accidentally after a head injury, migrena and, as a rule, they are not accompanied by neurological symptoms in the beginning even though they are in the motor zone. Over time, they infiltrate the environment, sometimes progressing to a higher degree of malignancy and leading to neurological symptoms. That is why early surgical resection with subsequent oncological therapy is the therapeutic standard. Patients with low-grade gliomas have longer survival than patients with high-grade gliomas, with a median survival of 13 years with aggressive treatments.

A special problem is presented by patients in whom the low-grade glioma is located in the motor zone, and they still do not have a significant motor deficit. In such cases, in order to avoid the possibility that preventive resection results in a severe deficit and renders the quality of the operation, operative treatment is postponed as much as possible. In this sense, in the last 18 years, 42 patients with low-grade glioma, of both sexes, of different ages, were treated with the depot regulatory peptide LAR sandostatin and the increase in tumor size on MRI, the patient's functional status and changes in neurological and psychological status were monitored.

It is known that Octreotide via the SSR-2 receptor on the surface of tumor cells and endothelium reduces the production of ATP, which is necessary in the metabolism of tumor cells, reduces capillary proliferation, i.e. neoangiogenesis required in the process of further tumor infiltration, and also reduces the uptake of numerous growth factors by tumor cells. During the follow-up period of 7-15 years (average 9), the absence of increase in tumor volume on MRI, and the absence of deterioration of the patient's functionality, neurological and mental status were recorded in 37/42 patients, which represents a highly significant positive effect of octreotide.

Conclusion: The use of octreotide in the prevention of the growth of low-grade gliomas shows an extremely positive effect, the confirmation of which in a larger study could lead to reconsidering the need for early surgery of these tumors.

Keywords: low-grade glioma; octreotide; tretment

152 KEY ROLE OF MICROSURGICAL DISSECTIONS ON CADAVERIC SPECIMENS IN NEUROSURGICAL TRAINING: SETTING UP A NEW RESEARCH ANATOMICAL LABORATORY AND DEFINING NEUROANATOMICAL MILESTONES

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Neurosurgery is one of the most complex surgical disciplines where psychomotor skills and deep anatomical and neurological knowledge find their maximum expression. A long period of preparation is necessary to acquire a solid theoretical background and technical skills, improve manual dexterity and visuospatial ability, and try and refine surgical techniques. Moreover, both studying and surgical practice are necessary to deeply understand neuroanatomy, the relationships between structures, and the three-dimensional (3D) orientation that is the core of neurosurgeons' preparation. For all these reasons, a microsurgical neuroanatomy laboratory with human cadaveric specimens results in a unique and irreplaceable training tool that allows the reproduction of patients' positions, 3D anatomy, tissues' consistencies, and step-by-step surgical procedures almost identical to the real ones.

Methods: We describe our experience in setting up a new microsurgical neuroanatomy lab (IRCCS Neuromed, Pozzilli, Italy), focusing on the development of training activity programs and microsurgical milestones useful to train the next generation of surgeons. All the required materials and instruments were listed.

Results: Six competency levels were designed according to the year of residency, with training exercises and procedures defined for each competency level: (1) soft tissue dissections, bone drilling, and microsurgical suturing; (2) basic craniotomies and neurovascular anatomy; (3) white matter dissection; (4) skull base transcranial approaches; (5) endoscopic approaches; and (6) microanastomosis. A checklist with the milestones was provided.

Discussion: Microsurgical dissection of human cadaveric specimens is the optimal way to learn and train on neuroanatomy and neurosurgical procedures before performing them safely in the operating room. We provided a "neurosurgery booklet" with progressive milestones for neurosurgical residents. This step-by-step program may improve the quality of training and guarantee equal skill acquisition across countries. We believe that more efforts should be made to create new microsurgical laboratories, popularize the importance of body donation, and establish a network between universities and laboratories to introduce a compulsory operative training program.

Keywords: neuroanatomy laboratory; microsurgical dissections

153 APPROACHES TO PINEAL REGION: SURGICAL TECHNIQUES AND ANATOMICAL CONSIDERATIONS

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Access to the pineal region has always been a challenge for neurosurgeons. The parietooccipital interhemispheric transtentorial approach is a slight variation of the traditional occipital transtentorial approach that provides adequate exposure to the lesions of the pineal region without introducing additional risks.

In this study, the modified parietooccipital interhemispheric transtentorial approach is discussed including step-by-step anatomical cadaveric dissections and operative images. 27 adult patients (age > 18) who were operated over a 30-year period (1992–2022) by the senior author (M.N.P.) at two clinics, Marmara University, Department of Neurosurgery, Istanbul, Turkey and Acibadem Mehmet Ali Aydinlar University, Department of Neurosurgery, Istanbul, Turkey were analyzed. Only pineal region tumors were included in the analysis. Falcotentorial meningiomas and vascular lesions including cavernomas were excluded. 5 cadaveric specimens were dissected step by step following the surgical approach. Each step was documented using a Canon EOS 5D Mark II camera. Step by step images of the dissections were presented including comparison with surgical images. Additional illustrations were used to describe the surgical corridor. The surgical corridor is maintained anterior to the parietooccipital sulcus along the medial of the precuneus. No retraction to the calcarine sulcus resulted in no postoperative hemianopsia. The neurovascular structures along the surgical corridor along with the nuances of the tentorium incision and splenium resection are discussed. The parietooccipital interhemispheric transtentorial approach provides a wide and safe corridor for surgical resection of pineal tumors.

Keywords: The parietooccipital interhemispheric transtentorial approach; Pineal Tumors; The pineal region

154 INTRAOPERATIVE NEUROPHYSIOLOGY (IONM) IN TUMOR CASES. PROTOCOL REVIEW

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Subject: Intraoperative neurophysiology (IONM) in tumor cases. Protocol review.

Aim: The role of IONM in modern neuro-oncolgy as a guiding tool for the optimization of

surgical outcome and the preservation of neurological function.

Material & Methods: All the available protocols for monitoring and mapping are summarized and described. The details given emphasize in what is monitored, how, and for what purpose. More specifically we analyze the techniques below: SSSEP's, Phase Reversal, BAEP's, VEP's, mMEP's, nMEP's, CoMEP's, EMG (spontaneous and triggered).

Concerning the cortical and subcortical mapping in asleep and awake surgeries for motor and language eloquent areas assessment, a full comparison is attempted for the clarification of differences and limitations of each technique.

Conclusion: For each individual is mandatory to apply the right choice of the above-mentioned protocols, in the proper combination in order to acquire high sensitivity and specificity. The limitation of each protocol is crucial to be known, as the proper preparation and cooperation between the teams involved, is essential.

Keywords: Intraoperative neurophysiology ; IONM ; SSSEP's ; Phase Reversal ; BAEP's ; VEP's ; mMEP's ; nMEP's ; CoMEP's ; EMG (spontaneous and triggered)

155 MULTIMODAL STRATEGIES IN LOW GRADE GLIOMA SURGERY

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The surgical management of Diffuse Low-Grade Gliomas (DLGGs) has undergone significant changes over the past two decades. The combination of Awake Surgery (AS), Direct Electrical Stimulation (DES), and real-time neuropsychological testing (RTNT) now enables continuous feedback during surgery, allowing for greater precision in increasing the extent of resection (EOR). This study aimed to assess the impact of these technological advancements and the integration of multidisciplinary techniques on EOR.

A total of 320 patients diagnosed with DLGG were included in the study. The cases were categorized based on the evolving surgical protocols: 1. DES alone; 2. DES along with functional MRI/DTI image fusion using a NeuroNavigation system; 3. Protocol 2 combined with RTNT. Patients following Protocol 1 achieved a median EOR of 85% (ranging from 28% to 100%). In contrast, patients in Protocols 2 and 3 achieved median EORs of 88% (ranging from 34% to 100%) and 97% (ranging from 50% to 100%), respectively ($p = 0.0001$).

Transient postoperative deficits were observed in 42.96% of cases in Protocol 1, 34.31% in Protocol 2, and 31.08% in Protocol 3. Permanent deficits were recorded in 6.49%, 3.65%, and 2.7% of cases, respectively. The study had an average follow-up period of 7.8 years. Overall Survival (OS) was found to be influenced by molecular classification ($p = 0.03$), EOR ($p = 0.016$), and the preoperative tumor growth pattern ($p = 0.003$).

The multimodal surgical approach offers a safer and more comprehensive method for removing DLGGs, potentially leading to improved OS. However, further cooperative research is required to validate these monoinstitutional findings.

Keywords: low grade glioma; surgery; extent of resection; brain mapping; functional outcome; survival.

156 UPDATE ON CARE FOR CHILDHOOD EPENDYMOMA

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Introduction: In the past decade, the understanding and classification of the molecular underpinnings of pediatric ependymoma have advanced rapidly. We now define nine different molecular subtypes of ependymoma, with recent publications further sub-categorizing these tumors based upon driver mutations. Myxopapillary ependymoma has been changed from a WHO Grade I to Grade II tumor based upon clinical reports.

Materials and Methods: The authors will review the current nomenclature and sub-typing of childhood ependymoma and will discuss how this relates to treatment, prognosis and management. They will present data from a recent institutional review of 101 infants less than 3 years of age with posterior fossa ependymoma reporting 25-year follow-up, types of failures and neuro-cognitive performance data of long-term survivors.

Results: In this series of 101 infants treated, 71 patients had anaplastic histology and 30 classic (Grade II) histology. Seventy-four had PF-A ependymomas. Those who progressed did so within 2 years, with 24 dying from progressive disease and 6 from secondary neoplasia. Ten year event-free survival was 58.5% with an overall survival of 72.6%. Of those surviving, 98% have a high school diploma, 89% are either students or working and 64% hold a driver's license.

Conclusions: Despite significant gains in understanding the molecular genetics of ependymoma, extent of surgical resection remains the greatest determinant of survival. Focal radiation to the resection cavity significantly enhances survival but should be started within 30 days of surgery and in adequate doses. Neo-adjuvant chemotherapy may reduce tumor vascularity and facilitate gross total resection in young infants but, in study after study, has not proven to extend overall survival for this disease.

Keywords: ependymoma, ; infant tumor; PF-A

157 ENDOSCOPIC ENDONASAL TRANSSPHENOIDAL SURGERY IN CHILDREN: WIDENING THE SPECTRUM OF ONCOLOGICAL INDICATIONS IN THE PEDIATRIC AGE GROUP

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Introduction: In the last decade endoscopic endonasal transsphenoidal surgery (EETS) has been increasingly used in children to treat skull base lesions showing safety and efficacy.

Objective: The aim of this study is to present and analyze our experience of endoscopic endonasal transsphenoidal surgery in children.

Methods: 60 children (mean age: 11 years) were operated on with the endoscopic endonasal trans-sphenoidal approach in our institution from 2008 to date. All the procedures were performed by a team including both neurosurgeons and ENT surgeons, using the "two nostrils – four hands technique". Hormonal tests were conducted before and after surgery in all patients with sellar/ parasellar lesions. Perioperative ophthalmic examinations were carried out in patients affected by acuity and/or visual fields impairment. Multidisciplinary follow-up (ENT, endocrinological and neurosurgical) was conducted in all patients at one month, then varying according to pathology.

Results: Overall 73 procedures were performed, including tumor residuals/recurrences after a previous craniotomic approach (5) and reconstructive surgeries (1) (UN CASO DI FISTOLA POSTOP?). Gross total tumor resection was achieved in 38 (54%) patients, while a subtotal and a partial resection were performed in 16 (23%) and 17 (24%) cases, respectively. Craniopharyngioma was the most common histotype (22), followed by pituitary adenoma (17), pilocytic astrocytoma (7), chordoma (4), chondrosarcoma (4), germ cell tumor (3), angiofibroma (2), Rathke cleft cyst (2). No surgical mortality or neurological morbidity or late nasal complications were observed. Postoperative CSF fistula occurred in 4 patients (6%).

Conclusion: EETS has an increasing number of indications in children, wider than in the adult age . It's safety efficacy and contained morbidity has lead to consider it as first indication in many oncological diseases previously primarily considered for a craniotomic approach, as well as the main alternative surgical route in children with anterior skull base lesions initially operated through a craniotomy.

Keywords: endocopy, transphenoidal, tumor

158 RENIER H - TECHNIQUE AND TOTAL CRANIAL VAULT REMODELING IN CHILDREN WITH SCAPHOCEPHALY

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Introduction: The aim of the study was to compare the results of two surgical techniques for the treatment of isolated sagittal synostosis (ISS) by means of 3D stereophotogrammetry. One technique, the Renier's "H" technique (RHT) comprised a biparietal expansion, the other, the total vault remodelling (TVR) included also a frontal remodelling.

Methods: The two groups of operated children were compared with a third control group of normocephalic children. The 3D scanning was performed in all children between 12 and 245 months of age. On each 3D image six measurements and indices have been made, with the aim of evaluating not only length and width of the head, but also the height. The cranial index (CI) was measured in a plane parallel to the nasion-tragus plane, at the intersection with the opisthocranion.

Results: Each of the three groups (RHT, TVR, control group) included 28 children. The measurements that were influenced by the correction of the frontal bossing, namely the CI and the sagittal length, were closer to normocephaly after TVR than after RHT. Lesser or no statistical difference was documented in the measurements evaluating the biparietal aspect and the height of the vertex, indicating that the biparietal expansion is effective in both procedures.

Conclusions: Based on our results TVR results in a better esthetical outcome, particularly in relation to the direct surgical remodelling of the frontal bossing.

Keywords: Renier H - technique; total cranial vault remodeling; children; scaphocephaly

159 YET ANOTHER SCAPHOCEPHALY RECIPE: TSEO REVISITED

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Premature fusion of the sagittal suture is the most common type of craniosynostosis. There are many surgical solutions to treat this condition and almost everything works. Triple square extended osteotomy (TSEO) is one of the recent modifications of the original Rennier "H" procedure. It is implemented in order to make surgery more safer and to reduce blood loss and surgical time. Here we report 10-year results of our surgical technique and challenge its outcome over time.

Keywords: craniosynostosis, scaphocephaly, cranial remodelation

160 INTRODUCTION TO EANS GUIDELINES: HOW WE PERCEIVE THE IDEA OF RATIONALISING HEALTH CARE DELIVERY

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Clinical practice guidelines are a powerful tool in the hands of health care practitioners, professional societies and public health organisations all around the world. Their purpose is to guide medical decision making through explicitly formulated recommendations and suggestions. The complete methodology for guideline development is published in various reviews in an attempt to standardise this process. Still there is no consensus on this issue and no obvious inclination to a certain design methodology. In our talk we describe the general steps and key concepts of the development process used to create EANS Guidelines on various topics.

Keywords: EANS, guidelines, healthcare

161 PATHWAY OF THE YOUNG NEUROSURGEON IN THE FIELD OF VASCULAR AND SKULL BASE

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Introduction: Between three and eight years of experience after completing the specialization is considered as a period of YNS. Skull base and vascular surgery require an additional fellowship of one or two years in some countries of EU and the USA. Certain SeENS member countries have those fields of neurosurgery as narrow specialties or subspecialties, based on their complexity.

Aim: To present the contemporary approach of YNS in the field of skull base surgery and vascular neurosurgery.

Conclusions: The role of YNS in the field of vascular and skull base is demanding process. Nowadays, the path of YNS engagement is inconceivable without appropriate centers of expertise education not only in the field of microsurgery. Depending on the neurosurgeon's affinity multiple fellowship programs and cadaveric courses provides a good basis for a successful outcome.

Keywords: skull base, fellowships

162 SOCIAL MEDIA IN NEUROSURGERY

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Introduction: Social media has been increasingly utilized by individuals and organizations involved in neurosurgery. This talk describes the utility of social media in neurosurgery by user, provides an update on the current state of social media use in the field, and delineates recommendations for appropriate social media use for neurosurgeons.

Methods: A narrative review of existing literature and experiences was conducted.

Results: Patients and caregivers most commonly use Facebook and Twitter, whereas Twitter, LinkedIn, and Doximity are the most popular platforms used by neurosurgeons. Patient and caregiver posts commonly relate to seeking information or building community, hospitals seek to spread general neurosurgical information or attract patients, seek to highlight research from their faculty or attract patients, and neurosurgeons discuss novel research or developments in the field or form connections. Journals publicize their research, while professional organizations aim to promote their events or work by their members. Challenges in social media use include a lack of engagement, misinformation, privacy and confidentiality, divisive content, and a difficulty in managing negative comments. In addition to following their organization's social media policy, neurosurgeons should seek to discuss topics of interest related to neurosurgery and generate productive discussion with their colleagues, patients and caregivers, or organizations through their professional social media accounts. Neurosurgeons should avoid posting protected health information, political or inflammatory content, or specific medical advice.

Conclusions: Social media represents a useful tool for disseminating information and building community within neurosurgery. It is likely that the use of social media will stay constant to increase over time as its utility becomes increasingly recognized. However, appropriate discretion must be used to allow for productive interactions.

Keywords: neurological surgery; networking; social media

163 INTRODUCTION AND OVERVIEW. NEUROSURGICAL EDUCATION IN SERBIA ACROSS 100 YEARS

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This comprehensive paper delves into the remarkable journey of neurosurgical education in Serbia, spanning a century of progress and innovation. From its nascent beginnings in the early 20th century to its current position as a leading contributor to global neurosurgery, the evolution of this medical discipline in Serbia is a testament to dedication, resilience, and unwavering commitment to advancement.

The historical trajectory of neurosurgical education in Serbia is characterized by distinct phases, each marked by pioneering individuals and transformative developments. The early 20th century witnessed the emergence of basic neurosurgical procedures, with Serbian physicians, often trained abroad, performing sporadic interventions on the brain and spinal cord. These pioneering efforts laid the foundation for more advanced practices.

The pivotal moment in the history of Serbian neurosurgery occurred in 1923, when Milivoje Kostić conducted the first elective neurosurgical operation, a pituitary tumor extirpation through the nasal passage. Dr. Kostić's international recognition and tireless dedication propelled neurosurgery into a specialized field, leading to the establishment of the first independent neurosurgical department in 1938. Concurrently, neurosurgery classes were initiated at the Faculty of Medicine, solidifying the academic foundations of the discipline.

World War II posed significant challenges but also provided opportunities for furthering the discipline as the Kostić brothers and their team treated numerous wounded soldiers, strengthening the foundations of neurosurgical practice. Post-war developments saw the expansion of healthcare infrastructure, culminating in the establishment of neurosurgical clinics in major hospitals.

The 1960s and 1970s marked an era of expansion and innovation, with collaborative initiatives like the Neurosurgical Section of Yugoslavia and the adoption of advanced diagnostic tools like computerized tomography (CT) and magnetic resonance imaging (MRI). The 1990s presented challenges during the Yugoslav Wars but also fostered advancements in peripheral nervous system microsurgery.

In the early 2000s, Serbian neurosurgery underwent a significant renewal and transformation. This period marked a crucial turning point in the discipline's history, as it emerged from the challenges of the previous decades with a renewed sense of purpose and commitment to excellence. The reconstruction of neurosurgery in Serbia was underscored by the formation of the Serbian Neurosurgical Society in 2006, which played a pivotal role in fostering a culture of continuous improvement, knowledge sharing, and international collaboration. Through professional training, the pursuit of advanced techniques, and the establishment of state-of-the- art facilities, Serbian neurosurgery embarked on a path of resurgence. This era epitomized the resilience and determination of the neurosurgical community to rise above adversity and propel the field to new heights, reaffirming its position as a leader in global neurosurgery.

This century-long journey underscores Serbia's remarkable contributions to the field of neurosurgery, its dedication to shaping a promising future, and its enduring commitment to academic excellence through neurosurgery classes at the Faculty of Medicine. Looking ahead, Serbia's commitment to neurosurgical education and practice remains unwavering. Future plans include modernizing infrastructure, establishing specialized centers, and investing in cutting- edge equipment. A student neurosurgical section aims to inspire the next generation, ensuring the discipline's continued growth and contributions to global neurosurgery.

Keywords: Neurosurgery, Serbia, History, Education, Century Long

164 PROPHYLACTIC RPNIS REDUCE POSTOPERATIVE PAIN IN AMPUTEES WITH DIABETIC NEUROPATHY

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Introduction: Poor glycaemic control through the years in patients with diabetes causes peripheral neuropathy and in one portion of the patients is presented with pain, tingling or burning sensation. Impaired wound healing, infection and osteomyelitis contribute to diabetic gangrene and necrosis that leads to lower limb amputation. The aim of this study is to show the diabetic neuropathy through histopathological verification and evaluate the rehabilitation in patients with prophylactic RPNIs after lower limb amputation.

Materials and methods: A prospective study including 15 diabetic patients who had lower limb amputation with Regenerative peripheral nerve interfaces as a prophylactic surgical procedure was conducted at our clinic. We analyzed the demographics, comorbidities, duration of diabetes, histopathology of the nerves, pre and postoperative pain and usage of prosthesis.

Results: The results showed male predominance (87%) with average patient age of 78 years. Eighty percent of the patients had diabetes more than 15 years and 73% had more than two comorbidities (renal failure, cardiovascular disease, history of ischemic stroke). Histopathology examination of the transected nerves showed demyelination and axonal degeneration in all of the nerves as main hallmarks of diabetic neuropathy. Histopathology results correlated with preoperative pain in the patients. VAS score was used to analyze the postoperative pain. Ninety- two percent of the patients reported significantly pain reduction first week post amputation and all of the patients were pain free 6 months after surgery with RPNIs. The daily usage of prosthetic limb is average more than 8 hours/day 3 months post surgery.

Conclusion: Peripheral neuropathy has a major role in lower limb amputations in patients with diabetes who also suffer from phantom and stump limb pain postoperatively. Early rehabilitation and the use of prosthesis for the bigger part of the day even in elderly patients, confirms the positive RPNI effect as a prophylactic surgical technique that should be taken in consideration in diabetic patients.

Keywords: RPNI; peripheral nerve; diabetes; amputation

165 UNVEILING THE HIDDEN CULPRIT: POST-TRAUMATIC NEUROMAS AS THE SOURCE OF CHRONIC CHEST PAIN

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Introduction: Chronic chest pain often leads to misdiagnosis. However, the frequently overlooked cause is neuromas, which can result in pain. Chronic chest pain caused by intercostal nerve neuromas is a clinical condition that is commonly misdiagnosed and underestimated.

Methods: This study presents a series of three cases with persistent chronic chest pain that did not respond to non-surgical treatments. The patients had a history of blunt force chest wall trauma from incidents such as car accidents, hematomas, or falls. Despite seeking medical advice from various specialists to identify the origin of their pain, their condition remained undiagnosed. The patients described their pain as intense, sharp, stabbing, and burning. Physical examinations at our clinic revealed a positive Tinel sign along the lateral chest wall, and pain relief was achieved through a local anesthetic block (Dellon-McKinnon test). Surgical approach was strategically planned based on the site of the most intense Tinel positivity. During surgical exploration, the affected nerves were identified, and the neuromas were surgically resected and sent for histopathological analysis. Proximal dissection was performed, followed by implantation of the nerves into nearby muscles. Pain levels were assessed pre- and postoperatively using the Visual Analogue Scale (VAS).

Results: The average age of the patients was 47 years (range 36-62). Immediate pain relief was experienced by all patients following surgery. At the 6-month follow-up, the average preoperative VAS score was 7.5, while the average postoperative VAS score was 2. The statistical analysis demonstrated a significant difference (p-value < 0.05). One patient reported temporary anesthesia in a specific area of the chest wall, which subsequently disappeared completely. No other complications were reported. Histopathological analysis confirmed the presence of neuromas in all specimens.

Conclusion: Resection of intercostal nerve neuromas emerges as a viable therapy for individuals suffering from posttraumatic chest discomfort. Our findings underscore the importance of extensive and meticulous clinical investigations in individuals with post-traumatic neuromas. The cause of pain should never be overlooked, as it plays a key role in developing an effective treatment strategy. Therefore, a detailed history of pain and persistence of injury, even if minor as a cause, should never be underestimated. By diagnosing the presence of a neuroma and planning an appropriate surgical approach for all of our patients, we have successfully alleviated and eliminated the chronic pain that has plagued them for years.

Keywords: Neuroma; Chest Pain; Chronic Pain; Diagnosis; Trauma

166 PROLONGED LYMPHORRHOEA AS A RARE COMPLICATION OF THORACIC OUTLET SYNDROME SURGERY: A CASE REPORT

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The thoracic duct injury and a consequent lymphorrhoea represent an extremely rare complication sometimes seen in the surgery of the heart or the oesophagus. This injury sometimes results in the formation of chylothorax and can cause significant patient morbidity or even mortality. Thoracic duct injury is exceedingly uncommon complication of thoracic outlet syndrome operation with only few cases described in literature.

We operated on a 29-year-old female patient because of thoracic outlet syndrome pronounced on the left side due to hypertrophy of the anterior scalene muscle which was resected at the site of the distal attachment. During the first postoperative day, patient had 1.5 L of chyle leak, due to unrecognised thoracic duct injury. Fortunately, patient had no signs of chylothorax, since drainage tube was inserted at the end of the operation. Patient was successfully treated with conservative measures such as bed rest and total parenteral nutrition, and was discharged after 15 days of hospital stay with a complete resolution of lymphorrhoea and with normal neurovascular status of the left hand. Patient had complete resolution of preoperative symptoms.

Keywords: Thoracic outlet syndrome; The thoracic duct injury; Lymphorrhoea;

167 ISOLATED SCIATIC NERVE ENDOMETRIOSIS: A CASE REPORT WITH LITERATURE OVERVIEW

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Introduction: Endometriosis is a chronic recurrent disease characterized by ectopic growth of endometrial tissue outside the uterine cavity. While it commonly affects pelvic organs, rarely it can involve the lumbal plexus and extend outside of the pelvis, involving the sciatic nerve. To the best of our knowledge, regarding the English medical literature, there is only one case report of isolated sciatic nerve endometriosis without the involvement of the lumbar plexus and the rest of the pelvis cavity. The aim of this paper was to present a case of isolated sciatic nerve endometriosis and provide a concise overview of the existing literature on this unusual manifestation.

The case A 45-year-old woman presented with right sciatica and gait disturbance with an onset three years ago and progression in the past one year. At the admission, the neurologic examination indicated a reduced general motor strength of the right leg with right foot dorsiflexion graded 4+ according to the MRC (Medical Research Council) Muscle Test Scale. She was not able to to stand or walk on the heel and toes of the right foot.

MRI of the small pelvis on the right revealed gluteal muscle atrophy and a vague demarcated expansive lesion up to 2.5x3x4cm in the right piriform canal, which was recolored after contrast application.

Surgical exploration of the lesion was performed through a trans-gluteal approach. A diffusely altered sciatic nerve was identified in the piriform canal, where it was compressed by calcified fibrous tissue. Microscopic findings revealed a diffusely changed and thickened sciatic nerve, with cysts that were filled with dark liquid. The surgery was completed at the level of decompression, deliberation, and external neurolysis of the sciatic nerve.

The patient was satisfied with the outcome of the surgery and reported significant pain relief on the first postoperative day. There were no changes in the muscle strength compared to the status before surgery. Patohistological findings indicated an endometriosis of the sciatic nerve.

The patient was referred to a gynecologist for further evaluation and conservative management. During a 6-month therapy with diphereline, she was completely relieved of the pain complaints. However, after stopping the therapy, the pain has returned, with consequential gait disturbances and significantly altered quality of life. Further evaluation is planned in order to approve re-treatment with diphereline.

Conclusion: Endometriosis management depends on symptom severity, location, proliferation, patient desire, and age. In general, current therapies include medication and surgical removal of ectopic lesions. In cases where endometrial tissue compresses the nerve elements without infiltration, a timely surgical intervention, such as complete endometriosis excision and nerve decompression may prevent neurological damage. Management of isolated endometriosis involving the sciatic nerve remains the challenge. Further studies are needed to discover the pathophysiology of this manifestation, ways to prevent it, or treat with success.

Keywords: Peripheral Nerves, Neurosurgery, Endometriosis, Outcome Assesment, Case Reports

168 CHITOSAN-BASED NERVE GUIDE FOR THE PROTECTION OF PERIPHERAL NERVE COAPTATION SITES FOLLOWING TRAUMATIC HAND NERVE LESIONS: A LONG-TERM FOLLOW-UP STUDY

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Introduction: Traumatic nerve injuries often regenerate incompletely after epineural coaptation and may result in sensory and motor function loss and neuropathic pain. Prior research has shown that the use of a chitosan-based Reaxon Nerve Guide® (version 1) exerted neuroprotective effects during the initial phase of digital nerve regeneration. This study aimed to assess the long- term outcomes and degradation characteristics of both the initial version (1) and a meanwhile optimized version (2) of the Reaxon Nerve Guide®.

Methods: A total of 44 patients were examined. 20 patients were drawn from the cohort of the 2018 published study on version 1 of the tube, of which 10 were control and 10 tube patients. Long-term outcomes were investigated through assessments conducted 5-7 years after surgery. Fifteen patients implanted with version 2 of the Tube were followed 12-18 months postoperatively. An additional 9 patients implanted with version 2 were evaluated 3-6 months postoperatively. All patients underwent a comprehensive clinical examination of nerve and hand function, DASH, and sonographic examination. All patients with implantation >12 months underwent MR neurographic examination to assess the degradation behavior.

Results: In all patients with Reaxon version 1 (V1), the nerve tube could still be detected largely unchanged 5-7 years postoperatively using neurosonography and MR-neurography. Version 2 (V2) showed complete degradation in one patient, while incomplete degradation was observed in all other subjects. Tactile discrimination analysis, both V1 ($p=0.0301$) and V2 ($p=0.0078$) revealed significantly decreased sensitivity (2PD) in the long term (> 12 months) compared to patients without a tube. The initial improvements found in the first study (<6 months) were also confirmed with V2. In the long-term study of patients with V1, the DASH score was significantly increased ($p=0.0017$), also more patients reported numbness ($p=0.0102$) and hypersensitivity ($p=0.0189$) in the area of the affected nerve compared to the control group without a nerve tube.

Conclusion: The tube's beneficial neuroprotective attributes appear to primarily manifest during the initial months following implantation. However, in later stages, the observed incomplete degradation pattern contributes to unfavorable long-term clinical results, potentially attributed to an inferred foreign body reaction.

Keywords: digital nerve injury; nerve tube; chitosan; biodegradation; long-term outcomes

169 ENDOSCOPIC-ASSISTED COMBINED WITH OPEN TRANSGLUTEAL APPROACH FOR SCIATIC NERVE DECOMPRESSION FOLLOWING HIP TRAUMA SURGERY: A CASE REPORT

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Sciatic nerve injury after hip fractures or dislocations is not an unusual complication in orthopedic trauma. Acetabular fracture with associated sciatic nerve trauma is a serious injury with an incidence of 3.3-30%, and 1.5% after hip reconstruction, being the most common nerve at risk of damage in this region, as well as its peroneal division.

Improper or delayed diagnosis and management may seriously affect lower limb function, because of impaired gait biomechanics.

Many surgical approaches have been described to expose the sciatic nerve in this region. The transgluteal approach is made through a curvilinear incision at the mid part of the gluteal region; it allows an optimal exposure of the proximal segment of the sciatic nerve, from the sciatic notch to 10 cm distally. However, orthopedic approaches may differ from those used for nerve exposure.

We described a case of sciatic nerve injury because of retro-acetabular surface reconstruction with plate and screws after hip fracture and dislocation. The surgery used a combination of endoscopic-assisted technique and the "modified" transgluteal approach to avoid a second incision, properly identify the nerve injury site, and remove a misplaced screw.

Keywords: Sciatic nerve; transgluteal approach; endocopic-assited; hip fracture

Figure 1. Hip osteosynthesis

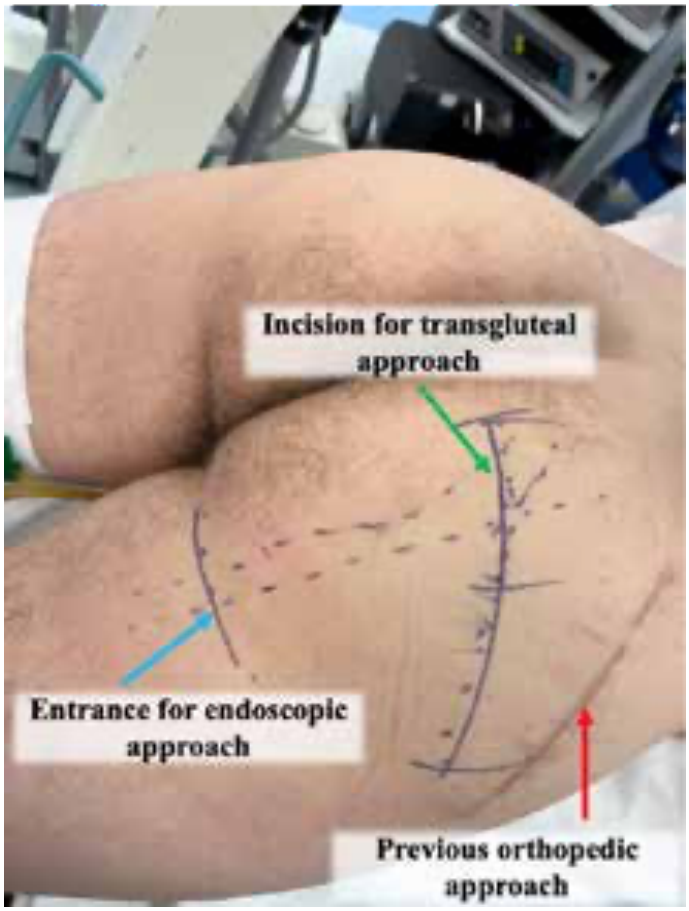

Figure 2. Surgical planning

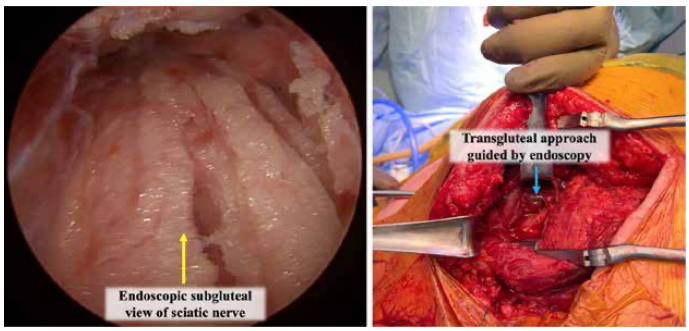

Figure 3. Endoscopic-assisted and modified transgluteal approach.

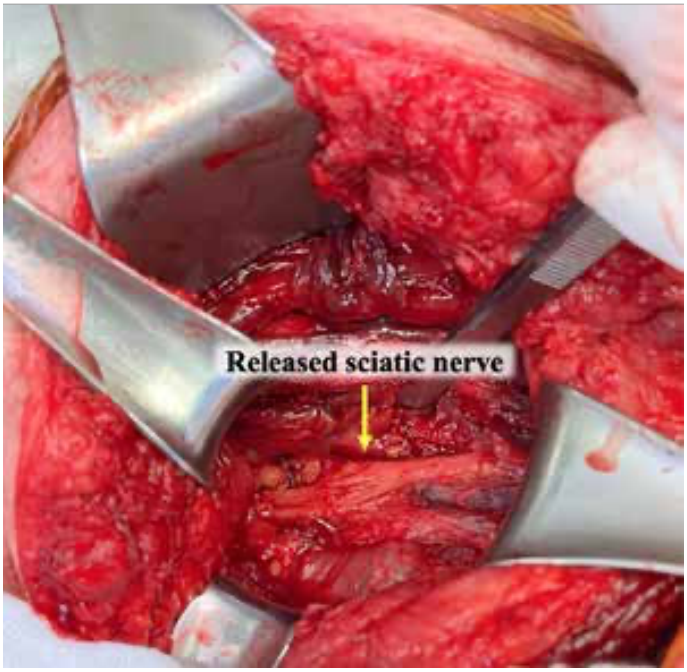

Figure 4. Sciatic nerve decompression.

170 SURGERY OF PERIPHERAL NERVE SHEATH TUMORS: THE CHALLENGES AND FURTHER PERSPECTIVES

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Peripheral nerve sheath tumors are uncommon growths originating from the protective layers surrounding nerves. Although often non-cancerous, these tumors can exert pressure on nerves, resulting in pain, weakness, and sensory disturbances. Surgical treatment plays a vital role in managing these tumors as it aims to alleviate symptoms, preserve nerve function, and prevent potential complications. Early and precise surgical intervention is essential to ensure the best possible outcomes for patients, emphasizing the critical importance of addressing peripheral nerve sheath tumors through surgery. This paper aims to present current trends, insights, and innovations in the surgical management of peripheral nerve sheath tumors, based on personal experiences and a literature review.

Keywords: Neurosurgery; Peripheral Nerves; Nerve Sheath Tumor; Review Literature, Outcome Assessment

171 NEUROMAS: UNRAVELING THE DIAGNOSTIC POTENTIAL OF PAIN

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Introduction: When not initially treated, nerve injuries can lead to formation of neuromas. The main reason behind this is the unorganized regrowth of the nerve's distal end, which causes the formation of bulbous structure and scarring. The purpose of this study is to highlight the significance of pain as a diagnostic indicator for patients with a history of trauma.

Materials and methods: In our clinic we have conducted a retrospective review of the medical records for three patients who underwent surgical resection of neuromas, followed by nerve implantation into a muscle. The review was focused on the patients' medical history, the cause of the neuromas, and the outcomes of the treatment. The diagnosis of neuroma was based on clinical symptoms such as pain around the scar, abnormal sensation in the affected nerve area and a positive Tinel sign. Diagnostic tests like the Dellon-McKinnon test and the Visual Analog Scale (VAS) for pain were used to confirm the presence of symptomatic end-neuroma. On average, the patients were followed up for a period of six months.

Results: Neuromas can develop from iatrogenic causes (in this case, an injury to the radial nerve during osteosynthesis of the humerus) or traumatic causes (such as a multidigit amputation involving the index and third finger with damage to the digital nerves, and a forearm laceration that initially overlooked injuries to the median and ulnar nerves). Consequently, these different scenarios resulted in the formation of neuromas in continuity, end neuromas, and scar-tethered nerves respectively. The surgical approach involved removing the neuroma bulb and relocating the nerve stump within muscle tissue. After a follow-up period of 6 months, all three patients who initially experienced neuroma pain reported a reduction in pain, with spontaneous pain disappearing. Additionally, all three patients reported a decrease in analgesic consumption related to neuroma pain.

Conclusion: The portrayal of pain and sensations can be extremely distressing and agonizing, often preventing patients from carrying out their usual daily tasks. It is important to promptly diagnose and refer patients with neuromas to a plastic surgeon, as delaying treatment can make the symptoms more difficult to manage as time goes on.

Keywords: neuroma; pain; end-neuroma; peripheral nerve

172 PREVENTION OF PERIPHERAL NERVE SCARRING USING FIBRIN GLUE IN THE RAT SCIATIC NERVE MODEL

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Introduction: Nerve adhesions and scar-related nerve compression after peripheral nerve injuries with resulting functional limitations and neuropathic pain symptoms are major challenges in clinical practice. Despite intensive research, no gold standard for the prevention of scarring and avoidance of scar-related nerve compression has been established in clinical use. Several experimental works have shown that the insertion of a biodegradable protective layer between the nerve and the surrounding tissue can reduce adhesion formation. This study investigates the use of the commercially available fibrin glue Tisseel® to prevent postoperative adhesions and perineural scarring.

Methods: Using the rat sciatic nerve model, the experimental animals (n=30) were divided into three groups (n=10 each): a sham group with exploration of the sciatic nerve alone, a control group without Tisseel® application, and the intervention group with the application Tisseel® onto the sciatic nerve. Scar formation was induced with 2.5% glutaraldehyde in the control and intervention group before Tisseel application®. The postoperative observation period was 12 weeks. Weekly functional analysis was performed using the Visual Static Sciatic Index. After 12 weeks, histological and histomorphometric analyses of the sciatic nerve were performed. Likewise, the gastrocnemius muscle and the anterior tibialis muscle were examined for weight differences as signs of atrophy.

Results: Animals treated with Tisseel® demonstrated a faster significant postoperative regeneration in functional assessment. In the histological analysis of the nerve specimens, the Connective Tissue Area measurement showed significantly less scar thickness (p=0.0451) in the Tisseel® treated group. Histomorphometric analysis showed increased fiber density (p=0.0474), as well as increased axon thickness (p=0.0031) and myelin sheath thickness (p=0.0214) in the fibrin glue treated group. Highly significant differences were found in the myelinated nerve fiber thickness (p=0.0009). The tibialis anterior muscle showed increased weight in the Tisseel® group compared to the control group (p=0.0258).

Conclusion: Fibrin glue application led to a significantly decreased scar tissue formation around the rat sciatic nerve in this study. The clearly improved histologic and histomorphometric results after fibrin glue coating prompt further exploration of the implied adhesion-preventive potential.

Keywords: peripheral nerve injury; scarring; adhesion; fibrin glue; nerve regeneration; microsurgery

173 BRACHIAL PLEXUS LYMPHOMA: A CASE REPORT WITH LITERATURE OVERVIEW

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Introduction: Brachial plexus neuropathy caused by neurolymphomatosis (NL) is a rare presentation of lymphoma. Primary NL of the peripheral nervous system is even rarer than that of the central nervous system. Despite the timely provided treatment, the prognosis for patients with NL is poor. This paper aims to present a case of brachial plexus lymphoma and review the literature on the subject.

Case Presentation: A 14-year-old female was examined due to pain in the shoulder and progressive right arm weakness. Electromioneurohrapghy (EMNG) findings indicated a possible lesion of the posterior and lateral fascicle of right brachial plexus, with potential involvement of the superior and medius trunks. Magnetic resonance imaging (MRI) indicated non-specific intensity changes of the superior and medius trunks.

Physical examination of the right limb indicated an upper right brachial plexus palsy with hypotrophy of the right-hand muscles. The supraclavicular brachial plexus exploration was performed. Intraoperative findings indicated altered structural anatomy of the superior and medius trunks. A sample of the nerve tissue was collected for the pathohistological examination.

After the surgery, the patient's condition was stable, without changes in the neurological status. Intensive physical treatment was started two weeks after the operation.

Patohistological findings indicated a diffuse non-Hodgkin large cell lymphoma. The patient was referred to a hematologist for further treatment. However, 1 month after the administered therapy, there was no improvement in muscle strength of the right arm, and there was an additional deficit in terms of left leg weakness.

Conclusion: Diagnostic measures such as MRI and PET-CT scans are crucial for early detection and accurate diagnosis of brachial plexus LN. Treatment options include systemic chemotherapy and/or intrathecal chemotherapy with or without radiotherapy. However, the prognosis remains poor for these patients. Further research is necessary to fully understand the pathophysiology of this disorder and provide the best possible outcomes for these cases.

Keywords: Neurosurgery, Peripheral Nerves, Brachial Plexus, Lymphoma, Case Reports

174 SURGICAL OUTCOME OF 122 ISOLATED MEDIAN NERVE INJURIES

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Introduction: Median nerve injuries are of great significance due to their profound impact on hand function and the resultant implications for an individual's overall quality of life (QOL). As one of the major nerves controlling hand movements, it plays a central role in fine motor skills and sensory perception. Injuries to this critical nerve may result from various causes and lead to a range of debilitating symptoms such as weakness, numbness, and loss of dexterity. Consequently, surgical treatment for median nerve injuries is crucial in restoring not only hand function but also the patient's ability to perform daily tasks, thus enhancing their overall well- being and quality of life.

The aim: The objective of this study was to retrospectively assess functional outcomes and QOL in patients who underwent surgical treatment for isolated median nerve injuries over a two-decade period.

Methods: The study included 122 consecutive isolated median nerve injuries surgically treated from January 1st, 2001 to December 31st. The patients with associated radial or ulnar nerve injuries were excluded from the study. The outcome was assessed by measuring muscle strength using MRC (Medical Research Council) grading scale and disability-related QOL using the DASH (Disability of Arm and Shoulder) questionnaire. The minimal follow-up period was 12 months.

Results: The majority of patients in the study were male. The most prevalent mechanisms of nerve injury were sharp and blunt lacerations, while the most common location was the distal forearm. Almost all patients presented with associated injuries alongside their nerve injury. Disruption of nerve continuity was observed in the majority of cases. Surgical interventions encompassed procedures such as neurolysis, split repair, interfascicular repair, and cable nerve grafting. Useful functional recovery, defined as achieving a grade of MRC 3 or higher, was attained by the majority of patients. Instances of upper extremity disability, as measured by the DASH score, were infrequent postoperatively. However, in some cases, high DASH scores were attributed to postoperative pain, irrespective of the satisfactory muscle strength achieved (according to MRC grade).

Conclusion: Median nerve surgery has a significant impact on preventing disability and preserving the QOL. However, it's worth noting that in certain cases, postoperative disability was linked to postoperative pain, irrespective of the satisfactory muscle strength achieved. This underscores the importance of comprehensive pain management strategies in optimizing outcomes following median nerve injury surgery.

Keywords: Neurosurgery; Peripheral Nerve Injuries; Median Nerve; Outcome Assessment; Quality of Life

175 DEEP BRAIN STIMULATION IN DISORDERS OF CONSCIOUSNESS: 10 YEARS OF A SINGLE CENTER EXPERIENCE

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Introduction: 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. 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.

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.

Conclusion: In patients with DoC, spontaneous recovery to the level of consciousness is rare. In patients with DoC lasting longer than 12 months following traumatic brain injury or 6 months following anoxic-ischemic brain lesion, spontaneous recovery 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.

Keywords: Deep Brain Stimulation; disorder of consciousness; centromedian-parafascicular nucleus of thalamus; unresponsive wakefulness syndrome; minimal consciousness state

176 DECREASED BRAIN VOLUME MAY BE ASSOCIATED WITH OCCURRENCE OF PERI-LEAD EDEMA IN PARKINSON DISEASE PATIENTS WITH DEEP BRAIN STIMULATION

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Background: Peri-lead edema (PLE) is a poorly understood complication of deep brain stimulation (DBS), which has been described in patients presenting occasionally with profound and often delayed symptoms with an incidence ranging from 0.4% up to even 100%. Therefore, the aim of our study is investigate the association of brain and brain compartments volumes on the magnetic resonance imaging (MRI) with the occurrence of PLE in Parkinsons disease (PD) patients after DBS implantation in subthalamic nuclei (STN).

Methods: This retrospective study included 125 consecutive PD patients who underwent STN DBS at the Department of Neurosurgery, Dubrava University Hospital in period 2010-2022. Qualitative analysis was done on postoperative MRI T2-weighted sequence by two independent observers, marking PLE on levels of mesencephalon, thalamus, and subcortically level as mild, moderate or severe. Quantitative volumetric analysis of brain and brain compartments volumes was conducted using an automated CIVET processing pipeline on preoperative MRI T1 MPRAGE sequences. In addition, observed PLE on individual hemisphere was delineated manually and measured using Analyze 14.0 software.

Results: In our cohort, PLE was observed in 32.17%, mostly bilaterally. Mild PLE was observed in majority of patients, regardless of the level observed. Age, sex, diabetes, hypertension, vascular disease and the use of anticoagulant/antiplatelet therapy showed no significant association with the occurrence of PLE. Total grey matter volume showed significant association with the PLE occurrence (r=-0.22, p=0.04), as well as cortex volume (r=-0.32, p=0.0005). Cortical volumes of hemispheres, overall hemisphere volumes, as well as hemisphere/total intracranial volume ratio showed significant association with the PLE occurrence. Furthermore, volume of cortex and total grey volume represent moderate indicators, while hemisphere volumes, cortical volumes of hemispheres, and hemisphere/ total intracranial volume ratio represent mild to moderate indicators of possible PLE occurrence.

Conclusion: The results of our study suggest that the morphometric MRI measurements, as a useful tool, can provide relevant information about the structural status of brain in patients with PD and represent moderate indicators of possible PLE occurrence. Identifying patients with greater brain atrophy, especially regarding grey matter prior to DBS implantation, will allow us to estimate the possible postoperative symptoms and intervene in a timely manner. Further studies are needed to confirm our findings and to investigate other potential predictors and risk factors of PLE occurrence.

Keywords: peri-lead edema, DBS, MRI, volumetry, Parkinson disease 420

177 DEEP BRAIN STIMULATION AND STRUCTURAL BRAIN MRI CHANGES IN PARKINSONS DISEASE – PRELIMINARY STUDY

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Introduction: 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? 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 imagining (MRI).

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.

Conclusion: 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.

Keywords: Parkinson disease, DBS, MRI, volumetry

178 PERMEABILITY GLYCOPROTEIN (P-GP) AND MULTIDRUG RESISTANCE PROTEIN-1 (MRP-1) IN DRUG-RESISTANCE IN MESIAL TEMPORAL LOBE EPILEPSY

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Introduction: Drug efflux transporters may be involved inhe pathogenesis of drug-resistance in Mesial Temporal Lobe Epilepsy (MTLE). The major drug-efflux transporters are permeability glycoprotein (P- gp) and multidrug-resistance associated protein-1 (MRP-1).

Methods: P-gp and MRP-1expression was studied in the sclerotic hippocampal tissue resected from the epilepsy surgery and compared with the expression profile in tissues resected from non- epileptic autopsy cases.

Results: Statistically significant over expression of both P-gp and MRP-1 at gene and protein levels was found in the MTLE cases. Immunohistochemistry of patient group showed increased immunoreactivity of P-gp at blood brain barrier and increased reactivity of MRP-1 in parenchyma. The results were confirmed by confocal immunofluorescence microscopy.

Conclusion: The study conclusively proves that P-gp in association with MRP-1 is responsible for the multi-drug resistance in epilepsy. The increase in efflux transporters levels can be pharmacologically inhibited to achieve optimal drug penetration to target site in refractory mesial temporal lobe epilepsy and avoid surgery for seizure control.

Keywords: Drug resistance; temporal lobe epilepsy; efflux transpoeters

179 TRIGEMINAL NEURALGIA, ASSOCIATED WITH MASS LESIONS OF CEREBELLO-PONTINE ANGLE

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Most common cause of trigeminal neuralgia (TN) is vascular compression of trigeminal nerve root (TNR). In case of association with cerebello-pontine angle (CPA) lesions cause of TN can be direct or mediated compression of TNR by lesion. Because of variability of anatomical relationships the surgical tactics remain unclear.

57 patients (19-84 years old) with TN and ipsilateral mass lesion of CPA (28 right sided, 29 – left sided) were analyzed in this study. Mass lesions were meningeomas in 31 cases, epidermoids in 12 cases, vestibular schwannomas in 12 cases, cavernoma in 1 case and lipoma in 1 case. All patients operated via retromastoidal approach, 55 lesions were resected completely, in 2 cases remnants of epidermoids were left beyond CPA. Tn wege gone in all cases, no mortality or persistent morbidity registred.

6 types of TNR compression by vascular structures and mass lesions were found. Isolated mass lesion compression (Type I and II) were found in 39 cases, mass lesion within TNR (Type III) were found in 2 cases, double compression of TNR by vascular structure and mass lesion (Type IV and V) were found in 14 cases, and pure vascular compression were found in 2 cases. After mass lesion resection microvascular decompression (MVD) were performed in 16 cases.

Conclusion: Most common cause of trigeminal neuralgia, associated with mass lesions of cerebello-pontine angle is direct compression of TNR by mass lesion, in some cases cause of TN is double compression by vascular structure amd mass lesion. Aim of surgical treatment of trigeminal neuralgia, associated with mass lesions of cerebello-pontine angle is on decompression of TNR and performing MVD if needed.

Keywords: Trigeminal Neuralgia; Tumor; microvascular decompression

180 NEUROMODULATION EXPERIENCE IN TREATMENT OF CHRONIC PELVIC PAIN SYNDROME

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Introduction: Chronic pelvic pain or chronic pelvic pain syndrome (CPPS) is one of the most challenging syndromes to treat. According to WHO it occurs in 4-43, 4% of patients suffering from chronic pelvic pain. Treatment efficacy remains low, which may be due to addition of depression, ipochondria, social inadaptation, higher percentage of pharmacological resistance (20-65%). Pain syndrome may even ameliorate after surgical treatment. All that necessitates the search for new treatment strategies, which include neuromodulation.

Material & Methods: We analyzed the outcomes of treatment of 58 patients at our institution. These patients were previously treated, but results were unsatisfactory. Visual Analogue Scale (VAS), LANSS, Pain Detect, DN4 questionnaires were used to assess pain intensity and prevalence of neuropathic component. Additionally the levels of anxiety, depression, and pain catastrophizing were assessed. The impact of pain on quality of life (QOL) was assessed by using a modified Brief Pain Inventory. Electrodes for test stimulation were implanted in all patients as a first phase of treatment. In 28 cases sacral root stimulation was implemented (6 – unilaterally, 14 - bilaterally). In 16 patients electrode was placed at sacral intumescence, in 26 patients a combined neurostimulation was implemented.

Results: Testing phase was perceived as positive in 49 (84, 48%) patients. Later these patients had received systems for sacral neuromodulation. In the group characterized by positive testing period VAS has been improved from preoperative 7.9 (min – 5, max -10, median - 8) to 4, 9. Most significant was the improved QOL that consisted of diminished pain intensity, reduction of pain aches and increase in patient's daily activity, self-reliance, social interaction, improvement of sleep and sexual activity.

Conclusions: The use of surgical neuromodulation allows to achieve reliable pain reduction and to improve the quality of life in majority of patients suffering from chronic pelvic pain refractory to conservative treatment.

Keywords: Sacral neuromodulation, Chronic pelvic pain syndrome, quality of life,

181 VASCULAR DECOMPRESSION RESULTS IN 110 PATIENTS WITH HEMIFACIAL SPASM

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The aim of study was to evaluate facial nerve compression factors and compare the effectiveness of interposition and transposition surgical techniques in 110 patients with hemifacial spasm.

Implant interposition was performed in 52 cases, and vascular transposition was performed in 58 cases. Compressing vessels were anterior inferior cerebellar artery in 44 cases, posterior inferior cerebellar artery in 34 cases, vertebral artery in 28 cases and veins in 4 cases. Multiple vascular compression was found In 27 cases. In 2 cases tumors (petrous apex meningeoma and jugular foramen tumor) were associated with vascular compression.

Complete regress of symptoms after surgery was archieved in 104 cases, incomplete regress – in 6 cases. Temporary facial weakness in 4 cases and hearing loss in 5 cases observed only in interposition group. Repeated microvascular decompression observed in 1 case.

Conclusion: Most frequent compressing vessels were cerebellar arteries. Transposition technique is very effective and has less chance of causing facial palsy and hearing loss.

Keywords: Vascular decompression; hemifacial spasm

182 MRI MORPHOMETRIC AND DTI PARAMETERS AS POTENTIAL PREDICTIVE FACTORS IN EVALUATION OF PATIENTS WITH DISORDERS OF CONSCIOUSNESS PRIOR TO DBS

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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. 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.

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.

Conclusion: 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.

Keywords: disorders of consciousness, DBS, MRI, volumetry, DTI

183 NEUROPHYSIOLOGY OF PSYCHOSURGERY: PERIPHERAL NERVE AND DEEP BRAIN STIMULATION

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Neurophysiological changes associated with peripheral nerve (PNS) and deep brain stimulation (DBS) for the treatment of psychiatric disorders are complex and not fully understood, but research in this area has provided some basic insights into the mechanisms of action. These treatments are typically used for severe and pharmaco-resistant psychiatric conditions and the exact neurophysiological mechanisms may vary depending on the specific condition and stimulation target. The aim of this paper was to review the literature and provide the latest insights into the neurophysiological aspects of PNS and DBS use in the treatment of psychiatric disorders.

Compared to DBS, PNS is less common for psychiatric disorders and usually involves vagus nerve stimulation (VNS) for the treatment of refractory depression. By modulating the release of neurotransmitters and influencing the neural networks involved in mood regulation, stress response, and emotion processing, the PNS may contribute to mood regulation and alleviate depressive symptoms. In the case of VNS, the neural circuits associated with depression are influenced by stimulating the vagal afferent fibers which convey signals to the brainstem, specifically targeting locus ceruleus and dorsal raphe nucleus. Imaging methods have provided insights into acute, subacute, and chronic changes that occur in the higher integrative centers as a consequence of VNS.

DBS is a more established treatment for certain psychiatric disorders, and it involves the implantation of electrodes into specific brain regions. The most common indications include obsessive-compulsive disorders (OCD), refractory major depressive disorders (MDD), aggressiveness, anorexia nervosa (AN), and drug addiction. The pathophysiology of these disorders often includes abnormal patterns of neuronal activity within specific neuronal circuits. Placing the DBS electrodes into precisely defined regions can modulate these circuits and restore normal excitation patterns, which may help alleviate the symptoms. Beyond its immediate role in the modulation by regulating neuronal activity and neurotransmitter release, DBS also holds significance in inducing neuroplastic changes within the brain. These changes may induce the creation of fresh neural connections or the re-establishment of existing ones. A deeper understanding of these connections may enhance and expand the potential applications and efficacy of the DBS treatment of psychiatric disorders.

Keywords: Neurosurgery; Psychosurgery, Peripheral Nerve Stimulation, Deep Brain Stimulation, Neurophysiology

184 LUMBAR PERITONEAL SHUNT IN PTS WITH VARIOUS NEUROLOGICAL PROBLEMS

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Objective: Comprehensive examination of patients with various neurological symptoms associated with brain. To determine the real role of CSF in the cranial cavity.To determine the relationship between CSF and intracranial pressure.To determine full diagnostic ability of lumbar puncture and lumbar peritoneal shunt.

Material– Method: From March 2020 to April 2023, we performed lumbar puncture, as diagnostic method, in 130 patients, 76 male and 44 female, age 54 to 92, with various neurological symptoms and unsuccessful conservative treatment. We measured the intracranial pressure and removed 25-30 ml of CSF. 5 minutes after the procedure these patients mobilized, communicated and characterized the symptoms they had previously. In 80 pts was placed LP Shunt with 1, 5 pressure. We had follow up for all these patients in the post-operative period 2 weeks – 2 years.

Results: The majority of the elderly people 92, 7%, has normal pressure hydrocephalus. In all patients that undergone un operation we had improvement of their neurological symptoms. In 7 pts it was necessary to do reoperation for revision, due to shunt block. No post-operative infection. All patients and their relatives satisfy with this kind of operation.

Conclusions: The measuring of the intracranial pressure and removing 20-30 ml of CSF wit Lumbar puncture, is the method to know if it is necessary to proceed for shunt operation in patients with various neurological problems. The lumbar peritoneal shunting is better in patients with normal pressure hydrocephalus.

Keywords: Hydrocephalus, Shunt

185 THINK TWICE ABOUT GROWTH HORMONE THERAPY IN A PATIENT WITH HEADACHES AND SHORT STATURE

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Purpose: Pituitary tumors are rare in childhood, representing only 3% of all intracranial neoplasms in children. Non-secreting pituitary tumors are observed even less frequently in children, as they do not grow sufficiently in early life to induce symptoms. Little is reported about the clinical sequelae of non-secreting pituitary tumors, which have an insidious course and may not be diagnosed until children have significant neurological deficits. Here, we present a case of delayed pituitary adenoma diagnosis in an adolescent with persistent headache and double vision.

Methods: The patient's medical charts were reviewed, and relevant clinical data was collected.

Results: A 16-year-old boy with short stature on growth-hormone replacement therapy was referred to neuro-ophthalmology for persistent headache and intermittent double vision. Since starting growth-hormone therapy for 2 years, the patient reported no improvement of his symptoms. No neuroimaging had been performed prior to initiation of therapy. On exam, corrected visual acuity was 20/40 on the right and 20/25 on the left eye. Intraocular pressures were within normal limits. Automated visual field test showed a dense bitemporal hemianopic visual field defect. Subsequently, brain MRI was performed and revealed a large pituitary mass compressing the optic chiasm. The tumor was resected shortly following the discovery of the tumor, and the patient's vision returned to baseline with resolution of double vision. Six months after surgery, all his symptoms, including headache, resolved. Moreover, he grew 4 inches in height and gained 16 pounds of weight.

Conclusions: Non-secreting pituitary tumors progress insidiously and may cause short stature secondary to hormonal deficiency. A low threshold for neuroimaging in pediatric patients with short stature presenting with suspicious neurological signs can lead to prompt diagnosis and appropriate management.

Keywords:Pituitary Adenoma; Pediatrics; Ophthalmology; Growth Hormone; Neuroimaging

186 MULTISTAGE EPILEPSY SURGERY APPROACH FOR DRUG-RESISTANT TUBEROUS SCLEROSIS COMPLEX-ASSOCIATED EPILEPSY IN CHILDREN

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Objective: This single-center, retrospective study appraised seizure related and other outcomes of resective surgery in TSC patients with drug-resistant epilepsy.

Background: Drug-resistant epilepsy is one of the major disease burdens in patients with tuberous sclerosis complex (TSC). Epilepsy surgery has been shown to be effective in TSC, but making a decision for surgery is often more complex than in other surgically amenable epilepsy syndromes and not all patients with TSC are eligible.

Material and Methods: Forty-eight children with TSC-related epilepsy had a presurgical investigation, and 37 of this group underwent epilepsy surgery. At follow-up, we assessed seizure outcome, indications for invasive presurgical investigation, indications, and contraindications to epilepsy surgery. Seizure outcomes were classified using the Engel scale.

Results: 37.5% (18/48) of patients underwent resective surgery after noninvasive presurgical investigation. 62.5% (30/48) performed invasive presurgical investigation as first step. After invasive-EEG 63.3 % (19/30) of patients underwent surgical treatment, 36.7 % (11/30) had contraindications to epilepsy surgery. 19% (7/37) of patients underwent second resective surgery, 2.7% (1/37) performed third resective surgery. At follow-up, 67, 6% (25/37) of the operated patients were seizure free (Engel I), 21, 6% (8/37)–Engel II-III, 10, 8% (4/37) – Engel IV.

Conclusion: Consequent epilepsy management aiming at seizure freedom, including presurgical evaluation and, if indicated, epilepsy surgery in a center specifically experienced with TSC-related epilepsy, is a worthwhile effort to improve quality of life in patients with TSC and their families. The presence of multiple bilateral brain lesions and/or multifocal epilepsy in children with TSC requires a multistage surgical approach involving invasive presurgical investigation.

Keywords: Epilepsy, invasive-EEG, TSC-epilepsy, epilepsy surgery.

187 PERI-INSULAR HEMISPHEROTOMY –THE SELECTION METHOD FOR HEMISPHERIC PATHOLOGY. EXPERIENCE OF MOROZOV CHILDREN CLINICAL HOSPITAL

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Epilepsy is one of the most common diseases of childhood, reducing the quality of life and significantly limiting the possibilities of rehabilitation treatment. Up to 30% of patients with epilepsy are drug-resistant. Every patient with established drug-resistant epilepsy is a candidate for surgical treatment. The choice of surgical intervention depends on the etiological cause of epilepsy, neurological deficits, structural changes according to neuroimaging data, and correspondence of the clinical and electroencephalographic picture.

Peri-insular hemispherotomy is the method of choice for single hemispheric structural changes, such as cystic-glial hemispheric changes due to a cerebral circulation disorder, Sturge-Weber syndrome, widespread malformations, Rasmussen encephalitis. Prolonged course of the epileptic process leads to developmental encephalopathy. Active epilepsy reduces the possibilities of rehabilitation treatment, which significantly reduces the quality of life of patients and leads to severe disability in adulthood. However, it is not always easy to decide quickly on surgical treatment for several reasons: 1) the debut of epilepsy from infantile spasms with no lateralizing signs according to the electroencephalographic picture; 2) the epileptic focus in the dominant hemisphere in children older 2 years and formed speech; 3) seizure recurrence due to insufficient crossing of conduction pathways or seizure onset from the healthy hemisphere.

Materials: During the period 2017-2022, 32 pediatric patients with structural changes in the hemisphere, neurological deficit in the form of hemiparesis, impaired cognitive and motor development were operated in the Morozov Children Clinical Hospital. Preoperative examination included: prolonged (1-3 days) EEG-video monitoring with seizure fixation according to 10- 20 system, 1.5 Tesla MRI of the brain, conducting a concilium consisting of the head of a neurosurgical department, neurosurgeons, epileptologists, neurophysiologists, radiologists, and neurologists.

The patients were divided into 4 groups according to etiology: 1) poststroke epilepsy in 14 patients (44%); 2) structural epilepsy due to widespread malformations in 11 patients (34.3%): 8 patients with focal cortical dysplasia (FCD), 2 patients with hemimegalencephaly, and 1 patient with tuberous sclerosis; 3) postinfectious epilepsy 5 patients (15.5%); 4) autoimmune epilepsy due to Rasmussen encephalitis 2 patients (6.2%). The median age of seizure debut was 7 months (0-120 months), the median age at the time of surgical treatment was 31 months (2-208 months), and the waiting time for epilepsy surgery was 0 to 189 months. The sex distribution was 17 of 32 (53.1%) girls. 1 patient was without drug-resistance. The mean number of antiseizure drugs used during the period of active epilepsy before surgical intervention was 4.5 (1 to 10), 9 patients had a history of hormone therapy failure, 1 patient was on a ketogenic diet and 1 patient with VNS-stimulator. All patients had neurological deficit in the form of hemiparesis contralateral to the hemisphere with structural changes, impaired cognitive and motor development. All patients underwent peri-insular hemispherotomy.

Results: Epileptic seizures in the early postoperative period were noted in 1 patient, which stopped within 2 days. The period of hospitalization ranged from 9 to 48 days. 2 patients had infectious complications; 1 patient developed cerebral edema in the early postoperative period. There were no lethal outcomes in any patient. Worsening of hemiparesis was observed in 26 patients, which required rehabilitation measures during in-patient treatment.

Two patients developed hydrocephalus in the distant postoperative period, which required installation of a shunt system; one patient had posthemorrhagic arezorbic hydrocephalus before surgical treatment of epilepsy. Follow-up was 6 to 66 months. Engel 1 was noted in 26 (81%) patients, Engel 2 in 2 patients with hemimegalencephaly, Engel 3 in a patient with extensive FCD, Engel 4 in 2 patients after encephalitis, and 1 patient with malformation (FCD). The good outcome in all patients with poststroke epilepsy and epilepsy due to Rasmussen encephalitis is noteworthy.

Conclusions: In our sample of patients with epilepsy, the efficacy of surgical treatment is consistent with the global literature. Prognostically, the most successful candidates for peri- insular hemispherotomy are patients with poststroke and autoimmune epilepsy. In the group of structural epilepsies associated with malformations, the lack of success is probably due to genetic causes and involvement of the healthy hemisphere in the epileptic process. In the group of postinfectious epilepsies, the lack of success is associated with structural changes in the less affected hemisphere despite electroencephalographic confirmation of epileptic seizures from the more damaged one at the preoperative stage.

Keywords: epilepsy; children; epilepsy surgery; peri-insular hemispherotomy

188 SURGICAL TREATMENT OF STRUCTURAL EPILEPSY. RESULTS OF THE MOROZOV CHILDREN'S CLINICAL HOSPITAL

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Introduction: Epilepsy is one of the most common diseases of childhood. In the world incidence of epilepsy is 61.4 per 100, 000 people in the Russian Federation in 2000, the incidence of epilepsy among children was 69.2 per 100, 000 people. Despite the emergence of new anticonvulsants, 30% of patients have pharmacoresistant epilepsy. The efficacy of the 3rd and subsequent anticonvulsants is no more than 3-5% with a high risk of seizure recurrence. Predictors of pharmacoresistance include: 1) multiple seizure types; history of epileptic status; recurrent epileptic seizures; and 3) structural changes on neuroimaging data. Epilepsy with onset in early childhood is more malignant because of the immaturity of sodium channels and the predominance of excitatory mediators of the brain with rapid formation of epileptic encephalopathy. In world practice, epileptological centers are currently established, including a multidisciplinary team, equipment, allowing various types of examinations and surgical interventions for surgical treatment of structural forms of epilepsy of any etiology in children of any age.

Objective: to analyze the outcomes of surgical treatment of patients with structural epilepsy.

Materials and Methods: All patients underwent a detailed pre-surgical examination, including long-term EEG-video monitoring with fixation of epileptic seizures, 1.5 Tesla MRI of the brain, and a consilium consisting of neurosurgeons, epileptologists, neuroradiologists, and neurologists from 2019 to 2022 at Morozov Children's Clinical Hospital. A total of 153 surgeries were performed. Resective surgery was performed in 103 patients, the remaining surgeries were VNS stimulator implantation and installation of invasive electrodes. The mean age of epilepsy onset was 15 years 2 months, the median age of epilepsy onset was 18 months. Median wait for surgical treatment was 28 months. The median number of anticonvulsant medications taken was 4.5 (1 to 12), and 7.8% had no formal signs of pharmacoresistance. Seventy-two percent of children had more than 30 seizures per month. 53% of the operations were performed on the right hemisphere. A frontal lobe resection was performed in 43 cases, a temporal lobe resection in 23 patients, a parietal lobe resection in 7 patients, and an occipital lobe resection in 3 patients. Twenty-four peri-insular hemispherotomies and 3 posterior quadrant discectomies were performed. Bilateral changes were noted in 23.3% of patients with tuberous sclerosis; after pre-surgical examination with invasive EEG-videomonitoring, a dominant tuber was determined followed by resection with peritumoral tissue. Histologically, focal cortical dysplasia was detected in 36 cases, tuberous sclerosis in 22, brain neoplasia WHO grade 1 (ganglioglioma or disembryoplastic neuroepithelial tumor) in 11 cases, and histological examination was not performed in 17 cases. At 12-36 months follow-up, 75 patients were analyzed. Engel grade 1 in 61.3% of patients: 75% in temporal forms, 65.9% in extratemporal forms, and 35.7% in tuberous sclerosis. Complications: the accession of infection was noted in 2 cases (1.9%), development of hydrocephalus in 4 cases. No lethal cases were registered.

Conclusions: Surgical treatment in childhood of structural forms of epilepsy is an effective and safe method of treatment. The decision on epilepsy surgery should be made collegially and upon detection of structural changes according to MRI brain data. Surgical intervention at an early age allows to stop epileptic encephalopathy, which gives a chance to improve psychomotor development due to the phenomenon of neuroplasticity and improve the quality of life. Morozov Children Clinical Hospital now meets the world standards of an epileptology center with the necessary equipment and specialists, as evidenced by the outcomes of surgical treatment of epilepsy.

Keywords: epilepsy; children; epilepsy surgery; tuberous sclerosis

189 PEDIATRIC CRANIOPHARYNGIOMA MIMICKING GIANT GLIOMA: A COMPLEX DIAGNOSTIC AND SURGICAL CASE

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Introduction: Brain tumors that originate during the perinatal period are extremely uncommon, and among these cases, craniopharyngiomas represent a minority. We present a case of an 11-week-old female patient with a large sellar and suprasellar tumor. Initially thought to be a giant glioma during prenatal assessment, the patient exhibited hypopituitarism, hyperprolactinemia, hyperkalemia, and hydro-electrolyte imbalances. The patient's main complaints upon admission included reduced muscle tone, irritability, projectile vomiting, impaired independent head movement, and a tendency to gaze preferentially to the right.

Clinical and Paraclinical Findings: Neurological examination revealed the patient's conscious state with normal attention and a social smile. Although she displayed a preference for looking to the right, she was able to move her head spontaneously in both directions. Notably, the patient had axial hypotonia, intact deep tendon reflexes, symmetric and responsive primitive reflexes, and functional continence. MRI of the brain depicted a sizable, heterogeneously enhancing mass measuring approximately 6 cm in diameter within the sellar and suprasellar regions.

Treatment: Surgical intervention was performed with macroscopic resection of the tumor by a multidisciplinary team. The surgery involved total tumor ablation, duraplasty, and anatomical suturing. Following the procedure, the patient's hemodynamic stability was compromised, necessitating transfer to the Neurosurgical ICU for specialized care and monitoring.

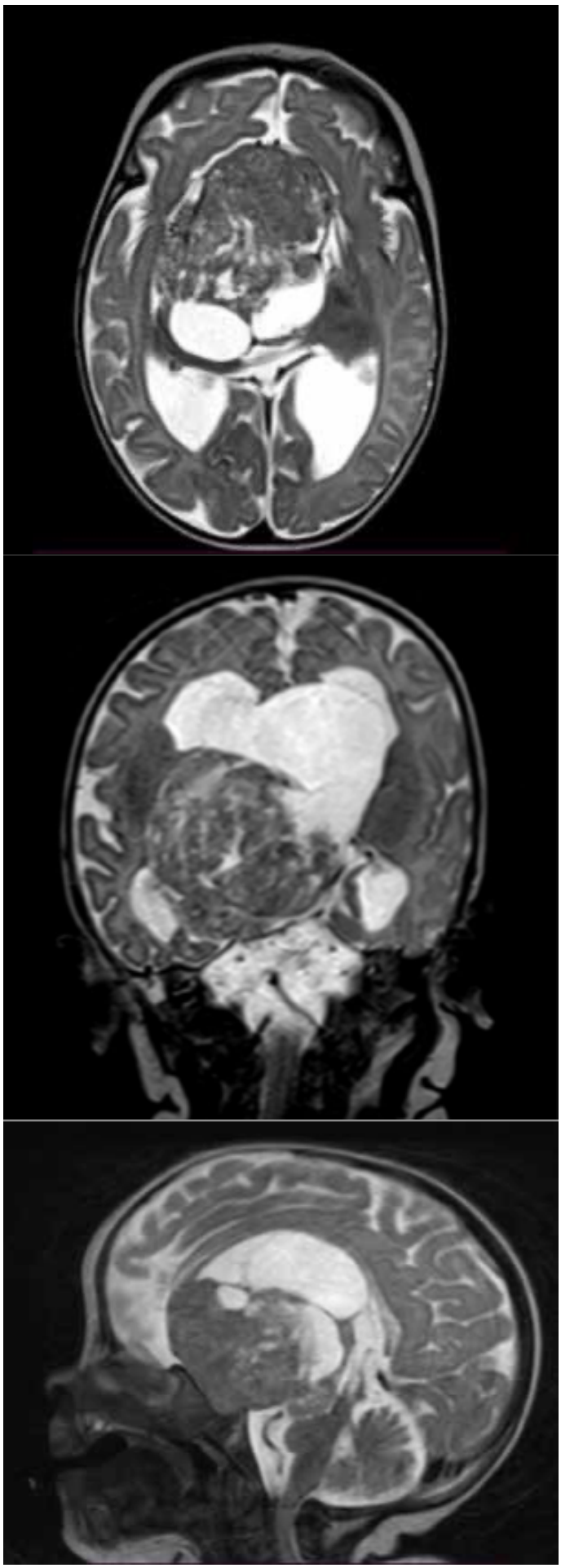
Postoperative Course: The 2-month-old patient was transferred to the Neurosurgical ICU due to fever, tonic-clonic seizures, and postoperative complications. She displayed favorable responses to intravenous midazolam and levetiracetam, with the fever controlled by antipyretics and external cooling methods. The patient maintained spontaneous respiration with oxygen supplementation and stable hemodynamics. Imaging revealed postoperative findings, including subdural collections, air fluid levels, and increased ventricular spaces.

Follow-up and Management: Over subsequent weeks, the patient's condition improved. Febrile episodes ceased, and her consciousness and respiratory status remained stable. Despite challenges like subdural fluid collections, antibiotic therapy, and fluid balance management, she demonstrated a positive response to treatment.

Discussion: This case highlights the complexity of diagnosing and managing pediatric intracranial tumors. The initial suspicion of a giant glioma was later revised to a craniopharyngioma based on surgical findings and extemporaneous examination, the final pathology examination being still a work in progress. The diverse clinical manifestations, ranging from hormonal imbalances to neurological deficits, further underscored the intricate nature of sellar and suprasellar lesions in infants. Surgical intervention, while successful, was accompanied by postoperative complications such as subdural collections and hydrocephalus, due to the sheer size of the excised lesion.

Conclusion: Our case report underscores the diagnostic challenges and intricate treatment approaches in pediatric patients with sellar and suprasellar tumors. The evolving clinical presentation, accurate diagnosis, multidisciplinary management, and vigilant postoperative care play critical roles in achieving favorable outcomes in these complex cases. Further studies and long-term follow-up are warranted to better understand the prognosis and optimal treatment strategies for such cases.

Keywords: pediatric; craniopharyngioma; neuro-oncology; neurosurgery



190 SELECTIVE DORSAL RHIZOTOMY (SDR): A COMPREHENSIVE REVIEW OF THE LITERATURE, CLINICAL OUTCOMES AND SURGICAL TECHNIQUES

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Introduction: The prevalence of spasticity varies significantly between countries, from 1–2/1000 live births in developed-countries to the maximum of 100/1000 live births. If left untreated, spasticity has the potential to give rise to persistent contractures, which can have detrimental effects on many functional abilities, including standing, walking, and bed mobility, thereby considerably compromising an individual's overall quality of life. The SDR is a neurosurgical procedure that has a significant role in the treatment of spasticity in patients with cerebral palsy (CP).

Methods: The PubMed database was searched for full-text articles in English that described the results of the surgical treatment, the SDR procedure, in children in the last 20 years. The paper analyzes the impact of SDR on motor function, gait patterns, quality of life in patients with CP. Also, the paper considers different SDR techniques and the potential risks and complications associated with each.

Results: The search retrieved 129 papers, however after excluding comments to papers, cost effective studies, and animal studies the total of 53 papers remained and were analyzed. The data available in the literature underlines the clear benefits of SDR for pediatric patients with bilateral spastic diplegia. However, in the literature, good outcomes and significant improvement were also reported for quadriplegic children, hereditary spasticity, after hemispherotomy, and even after hemispheric infarction.

There are different techniques currently used among neurosurgeons in this field, but the two main are: one level laminotomy and multiple level laminotomy. The laminotomy at L1 level offers a minimally invasive approach, however, the identification of the sensory roots that need to be divided, monitored, and cut is very difficult. On the other hand, a multilevel laminotomy is performed from L1 to S1. Using this approach, each dorsal root can be recognized easily, anatomically, at the correspondent foramen. In the older studies, where laminectomy or laminotomy using craniotome was performed, cases of spinal instability and scoliosis were reported. However, when a reciprocating microsaw was used, there was no reported cases of spinal stability issues. Complications are rare, bronchospasm (1-8%), urinary disturbances (4%), CSF leakage (1%), infection (1%), spinal deformities (4-14%), neuropathic pain and paresthesia are temporary and extremely rare.

The SDR procedure has to be combined with long-term physical therapy, and only in this setting has resulted in an effective and permanent reduction of spasticity and improved overall function. It is frequently combined with orthopedic procedures that can further improve step-lengths, knee flexion at initial contact and mid-stance, ankle dorsiflexion, foot progression, and the timing of peak knee flexion. Due to the inhibitory effect on ascendant interneurons, the spasticity of the upper limbs can be reduced, and speech can be improved.

Conclusion: Overall, this review of the literature aims to provide a well-rounded understanding of selective dorsal rhizotomy, its clinical outcomes, and its place within the different treatment modalities for children with spasticity. The management of cerebral palsy remains complex and a multidisciplinary approach is mandatory.

Keywords: multi-level laminotomy; one-level laminotomy; surgical treatment of spasticity

191 SURGICAL TREATMENT OF HEMORRHAGIC STROKE IN CHILDREN DUE TO RUPTURE OF AN ARTERIOVENOUS MALFORMATION AT THE CENTER FOR THE TREATMENT OF CEREBROVASCULAR PATHOLOGY IN CHILDREN

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Relevance: Arteriovenous malformation in children is a risk factor for hemorrhagic stroke.

Objective: To evaluate the effectiveness of emergency neurosurgical care (removal of intracerebral hematoma, with or without resection of brain AVM) in children with spontaneous intracerebral hemorrhages (IUD) with AVM rupture in the acute and subacute periods of hemorrhage. The development of optimal treatment tactics for hemorrhagic stroke due to rupture of the AVM of the brain in the pediatric population is an important task.

Materials: The research included 72 children who applied to the Morozov Children's Hospital., with a diagnosis of cerebral AVM with intracerebral hematoma. Age ranged from 1 month up to 18 years old. The median age was 6-9 years, of whom 36 (50, 0%) were boys and 36 (50, 0%) girls.

Research methods: Surgical treatment was performed in 61 of the 72 children. 7 patients were not operated on. We had complications that led to biological death in 4 patients. In neurological status: cerebral symptoms were the leading symptom in 52 patients. The assessment of focal symptoms was difficult due to the severity of the condition in 17patients. The level of impaired consciousness was determined by GCS: Clear consciousness in 17(23.6%), stunning in 23 (31.9%), stupor in 15 (20.9%), coma in 17 (23.6%). The most common localization of AVMs is the parietal lobe. Distribution of patients according to S-M gradation: AVM: type I — 9(12.5%), type II — 21(29.2%), type III — 26(36.1%), IV — 13(18, 1%), V — 3(4.1%) patients. The volume of intracranial hematoma ranged from 9 ml to 130 ml. In addition, to decide the further volume of surgical treatment were used the SCALEs: Greab, PedNIHSS, H-H. The average volume of intraoperative blood loss was 11.54% of the BCC. The ratio of ICH/brain volume averaged 2.93%.

Results: Based on the timing of admission to the hospital, the severity of the patient's condition, the size and localization of the hematoma, its relation to the mid-stem and basal structures, a decision was made on the need and scope of surgical intervention. Type of operation: Microsurgical for 31 (51%) patients, embolization for 12 (20%) patients and combined intervention (microsurgery+embolization) – 18 (29%) patients were performed.

Outcome: Complete regression of neurological symptoms in 34 (55.7%) patients, moderate disability in 20 (32.8%) patients, deep disability in -7 (11.5%) patients. Death in 2 (2.7%) patients.

Conclusions: Surgical tactics at the earliest possible time allows to achieve good outcomes in most patients.

Keywords: arteriovenous malformation of the brain in children, removal of arteriovenous malformation, hemorrhagic stroke

192 DECOMPRESSIVE CRANIECTOMY IN THE TREATMENT OF NON-TRAUMATIC INTRACRANIAL HEMORRHAGES IN CHILDREN

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Non-traumatic intracranial hemorrhage is a polyethiological disease with a high degree of disability and mortality both in adults and in children. The treatment of intracranial hemorrhage (ICH) in children widely uses intensive care protocols and surgical tactics extrapolated from those for the general population, but does not formulate clear indications for decompressive craniectomy in the acute period of hemorrhage with uncontrolled increase in intracranial pressure, which is the leading cause of progressive deterioration of the patient, up to the lethal outcome.

A retrospective analysis of the cases treated at Morozovskaya hospital in Moscow from 2018 to 2023 with confirmed nontraumatic intracranial hemorrhage was performed. Patients who underwent decompressive craniectomy in the acute period of hemorrhage were included in the study. Leading clinical manifestations of the disease were recorded, the neurological status in children at the time of manifestation of the clinical picture of ICH with stratification of the level of consciousness by the Glasgow Coma Scale and the FOUR scale was assessed. We analyzed CT-scans of the brain at the time of confirmation of intracranial hemorrhage, including neuroimaging signs of the degree of brain dislocation; using Brainlab neuronavigation station we determined the volume of hemorrhage and its ratio to the total volume of brain. Stratification of hemorrhages according to Fisher, Graeb,

Hunt-Hess, PICH (Pediatric Intracerebral Hemorrhage Scale) was performed, the timing of surgical intervention from the development of a symptoms of ICH was analyzed. Outcomes were determined according to the KOSCHI and Rankin scales and the Glasgow Outcome Scale.

The selection criteria were met by 26 patients. The mean age of hemorrhage development was 8 years 10 months (1 month; 17y10 months). In 17 children, the disease manifested with depressed level of consciousness (80.9%), vomiting was noted in 13 cases (47.6%), seizures in 10 (38%). The level of consciousness at the time of ICH detection was assessed, on average, as 7.8 on the SQG(4;12) and 8.5 on the FOUR(4;13). The ratio of survivors to those who died was 12:14(42, 8%:57, 2%). With a vegetative state among survivors in 3 children(2 RCHI, 2 KOSCHI), profound disability in 1 child(3 RCHI, 3a KOSCHI), moderate disability in 5 children(5-6 RCHI, 4a-4b KOSCHI) and good recovery in 3 children(7 RCHI, 4b-5a KOSCHI).

There were no statistically significant differences in the initial level of consciousness in the surviving and deceased children; the difference between the degree of brain dislocation according to CT scans was minimal in both groups. Hematoma volume relative to brain volume differed in both groups and averaged 4.9% for survivors and 7.26% for deceased patients. The mean difference between the time of disease manifestation and the time of decompressive craniectomy was significant; in survivors it was 9.5 hours, whereas in deceased patients it was about 16 hours.

Conclusions: It seems possible to formulate indications for decompressive craniectomy based on the ratio of hematoma volume to brain volume, and decompression within the first 10 hours after hemorrhagic stroke development can significantly improve the outcome.

Keywords: Decompressive craniectomy; pediatric neurosurgery; intracranial hemorrhage;

193 DIAGNOSIS AND SURGICAL TREATMENT OF CEREBROVASCULAR PATHOLOGY OF THE BRAIN IN INFANTS, CHILDREN AND ADOLESCENTS

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Relevance: Acute cerebrovascular accident is recognized as an adult disease rather, while it is one of the main causes of mortality in the population. However, in children, this disease, even if it is not a common disease, while the percentage of mortality and disability in the structure of this disease remains very high. With a frequency of 2-3 cases per 100, 000 children, stroke is among the top ten causes of child mortality and occurs as often as a brain tumor in children. A study of the hospital discharge database in California (USA) showed that the incidence of hemorrhagic stroke is 1.1 per 100, 000 people, and ischemic stroke is 1.2 per 100, 000 people.

The purpose of the Study: To develop an algorithm for early diagnosis and indications for surgical treatment of hemorrhagic stroke in children and adolescents on the basis of the first primary pediatric stroke center in the Russian Federation.

Materials and methods: The study is a single-center retrospective analysis. We examined and operated on 82 children with hemorrhagic stroke aged from 4 months to 17 years and 11 months. The median age was 9 years and 8 months, of which 47.2% were boys and 52.8% were girls. CT angiography and direct cerebral angiography were performed in all patients at the stage of afforestation. Of these, arterio-venous malformation is presented in 48 cases. Cavernous malformation is presented in 9 cases. Aneurysm is presented in 7 cases. Hemorrhagic stroke caused by hematological diseases is presented in 11 cases. Cryptogenic stroke is presented in 14 cases.

Results: 11 decompression hemicraniectomies, 21 cases of HVD implantation, 7 microsurgical extractions of intracerebral hematoma, 6 cases of microsurgical removal of intracerebral hematoma with simultaneous hemicraniectomy, 47 cases of removal of intracerebral hematoma with simultaneous microsurgical removal of vascular malformation, 5 cases of total egdovascular embolization of vascular malformation, 7 cases of microsurgical removal of vascular malformation were performed after partial or subtotal embolization.

Conclusions: The formation of the first algorithm in the Russian Federation for the examination of children and adolescents with hemorrhagic stroke allowed to reduce the level of deep disability mortality and to approach the world average for these signs, and in some nosologies even to reach a leading position. Still, the problem of stroke associated with hematological diseases remains unresolved, since with this pathology the risk of disability and mortality is the highest. There was also a high success rate of surgical interventions aimed at simultaneous removal of hematoma and vascular malformation, which in general distinguishes the approach to hemorrhagic stroke in children and adults.

Keywords: Avm; aneurysm; cavernoma

194 FRAMELESS STEREOTACTIC BIOPSY OF DIFFUSE BRAIN TUMORS IN CHILDREN. INDICATIONS, CONTRAINDICATIONS, EFFICACY

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Introdutcion: Stereotactic biopsy (STB) is a well-proven method of minimally invasive surgery allowing accurate and relatively safe verification of brain tumors of difficult to access localization. STB is universally used to obtain a histological diagnosis in cases where open surgery entails more risks than expected success.

Objective: Analysis of patients who underwent STB, determining indications, contraindications, as well as efficacy.

Materials and Methods: We retrospectively analyzed 51 patients who underwent STB of brain neoplasms of different localization in the period from 2012 to 2023. The children ranged in age from 6 months to 17 years, with a median age of 7 years and no statistical difference in sex ratio. The indications for STB were: diffuse tumor growth, deep localization, high risk of open surgery, no indication for open removal due to multiple CNS lesions (in 10 children). At the preoperative stage, all patients were found to have a brain tumor according to MRI-scans with contrast enhancement. Tumors had different localization - localization with involvement of medial structures was observed in 47.9%(25) cases, thalamus involvement was in 12.5%(6), hemispheric localization of neoplasm was in 27%(14), chiasmal-sellar area involvement was revealed in 12.5%(6) cases. Stereotactic biopsy under the control of neuronavigation systems (BrainLab optical navigation system, Medtronic magnetic system) was the method of choice of surgical approach in all patients. The majority of cases - 55% of brain tumors biopsy results were glioma of high malignancy, glioma of low malignancy - in 24, 45%, non-tumor lesion was revealed in 8.3%, glioblastoma and ganglioglioma of brain were revealed in 6.25%, Ewing's sarcoma, juvenile xanthogranulema, primitive neuroectodermal tumor - in 2% of cases for each histological variant, respectively. The informativity of the STB performed was 88%. The complication rate of bleeding during manipulation was 9, 8% (5), the lethality rate was 4.1% (2). According to the results of STB, histological material of 13 patients was sent for molecular study to search for mutations and selection of targeted therapy. In 11 of them mutations in tumor tissue were detected, which allowed targeting therapy in 4 cases.

Conclusion: STB is the method of choice in diffuse growing brain tumors of deep/multiple localization because of its relative safety and efficacy.

Keywords: pediatric neurosurgery; stereotactic biopsy; diffuse brain tumor;

195 MANAGING SUBDURAL EMPYEMA AND BRAIN ABSCESSES IN THE AGE OF ANTIMICROBIAL RESISTANCE: A RETROSPECTIVE STUDY OF PEDIATRIC CASES IN MOSCOW

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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. This retrospective analysis aimed to comprehensively investigate the clinical characteristics, management strategies, and outcomes of children diagnosed and surgically treated for subdural empyema or brain abscess within a pediatric neurosurgery department.

Methods: The medical records of children diagnosed and treated for subdural empyema or brain abscess at the Morozovskaya DGKB DZM in Moscow from September 2019 to April 2023 were retrospectively analyzed. Patients' data, including admission dates, 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: The study included 49 patients, predominantly male, with a bimodal distribution of ages and a median age of 8.5 years. Parenchymal brain abscesses were the most prevalent (46.94%), followed by subdural empyema (26.53%), and epidural abscess (26.53%). Seasonal variation showed higher case numbers in winter (39%) and autumn (29%). 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, nausea and vomiting, seizures, and lethargy. 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 was 25.5 days, and at discharge, no permanent neurological deficits or fatalities were observed. Follow-up imaging at six months revealed no residual lesions.

Conclusion: This study highlights the importance of an interdisciplinary approach to the management of subdural empyema and brain abscesses in children. The findings underscore the significance of early diagnosis, appropriate surgical interventions, and individualized antibiotic therapy in achieving favorable neurological outcomes. The results of this study contribute valuable insights that can guide future clinical decision-making and improve the management of these pathologies in children.

Keywords: children; brain abscess; subdural empyema; antibiotic therapy;surgical interventions

196 RARE PEDIATRIC SPINE ANOMALIES: A CASE OF LUMBOSACRAL AGENESIS AND MULTIPLE DYSRAPHISM

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Introduction: Agenesis of the Lumbosacral vertebrae, also described as caudal regression syndrome and Multiple Dysraphism are rare disorders of neurodevelopment with only few cases reported in literature in developing countries. Although the causes are unclear, genetic, folate deficiency and environmental factors have been mentioned to play a role in the pathobiology of these anomalies. We describe two cases, one patient with agenenis of lumbosacral vertebrae and another case of multiple dysraphism involving myelomeningocele, meningocele and lipomeningocele in one setting, with emphasis on imaging appearance of this case.

Case Reports

Case 1: One-month old healthy-looking male child presented with bilateral congenital popliteal contracture which was observed soon after normal delivery. On physical examination, the child had bilateral webbed knee posteriorly, could not extend the knee, bilateral buttock dimples and palpation of the spinous processes could not be appreciated below T11. The muscle bulk in both limbs decreased markedly from proximal to distal and lower extremities maintained a frog leg position and there was webbing of both popliteal fossae with the feet in calcaneus position. The other structures of the upper trunk were spared with no observed anomaly. Magnetic resonance imaging(MRI) of the spine revealed agenesis of the thoraco-lumbar below the level of T11 with the thecal sac terminating at T11/T12 level. The normal water density of muscles of the thighs and legs was replaced by fat density. The conus medullaris terminated mid-portion of T9 level with a truncated appearance of the spinal cord, features are highly suggestive of Tethered cord syndrome with Agenesis of Lumbar Vertebrae. The mother was counseled about long term prognosis and was referred to a tertiary institution.

Case 2: This is a full-term newborn baby girl delivered through a cesarean section due to an antenatal diagnosis of large head circumference and multiple masses in the upper thoracic and thoracolumbar spine and sacral region. Magnetic resonance imaging(MRI) of the brain and spine revealed communicating hydrocephalus, triple masses in the upper and lower back with the largest at the level of T6-9 which was cystic consistent with myelomeningocele(8*7cm), the second mass(3*3cm) was below the large mass at level of T11/12 consistent with meningocele whereas the third mass(2*3cm) was distantly at L5/S1 region and was a solid firm mass consistent with lipomyelomeningocele. The baby was operated at three weeks to repair all the defects and followed with ventriculoperitoneal (VP) shunt for treatment of hydrocephalus. The baby fared well in the post operation period and follow up at six months and one year was uneventful.

Conclusion: We report the first cases of lumbosacral agenesis and multiple dysraphism at Bugando Medical Centre, MRI the ideal modality for evaluation of the spine in congenital spine anomalies. In both cases, the medical history of the mothers was unremarkable in all clinical aspects hence further studies recommended to evaluate risk factors. Multi-disciplinary team approach in managing congenital spine anomalies is essential.

Keywords: Lumbosacral agenesis, multiple dysraphism, hydrocephalus, bugando medical centre

197 EPIDURAL SPINAL ABSCESS INDUCING HYDROCEPHALUS: UNCONVENTIONAL PRESENTATION AND COMPLEX SURGICAL TREATMENT - A CASE-BASED LITERATURE REVIEW

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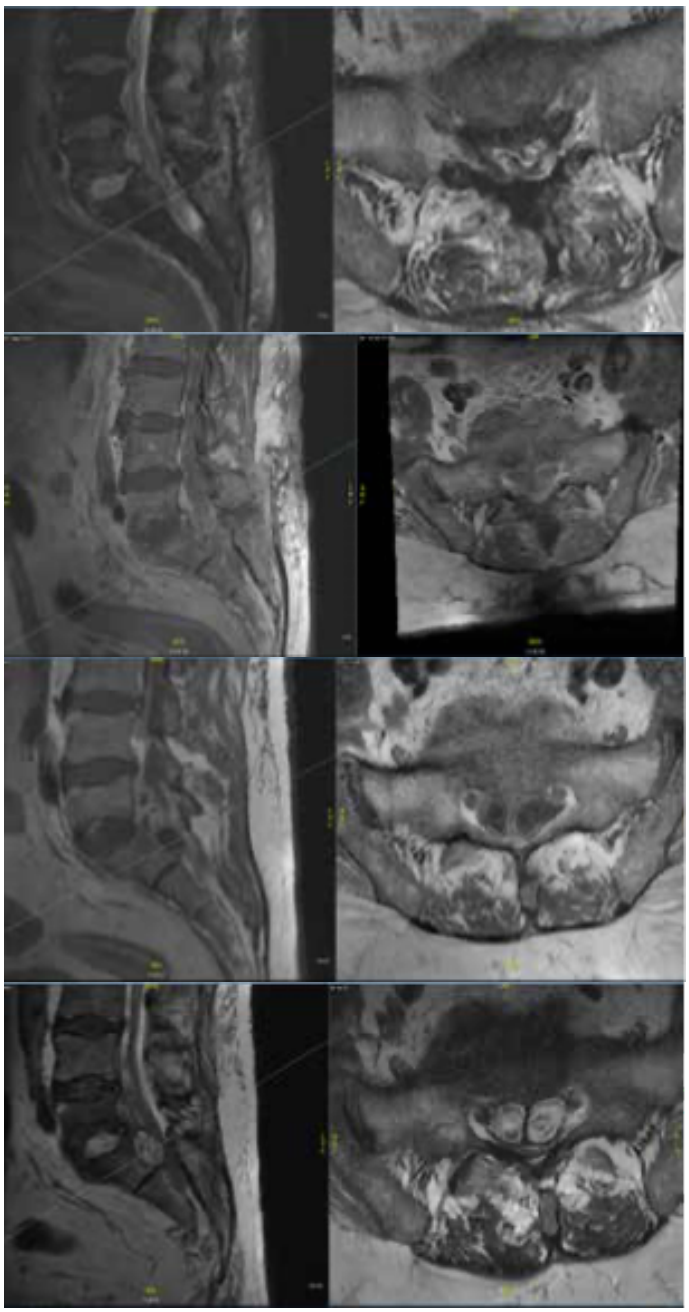
Introduction: Lumbar spinal abscess represents a rare pathology with an increasing incidence. In order to prevent the development of neurological deficits, it is necessary to diagnose the condition and initiate treatment in a timely manner. Nevertheless, nonoperative management has demonstrated some promising results in selected patients. Therefore, this case-based literature review aims to explore an uncommon complication of the lumbar spinal abscess, hydrocephalus, and provide insights into its diagnosis and management.

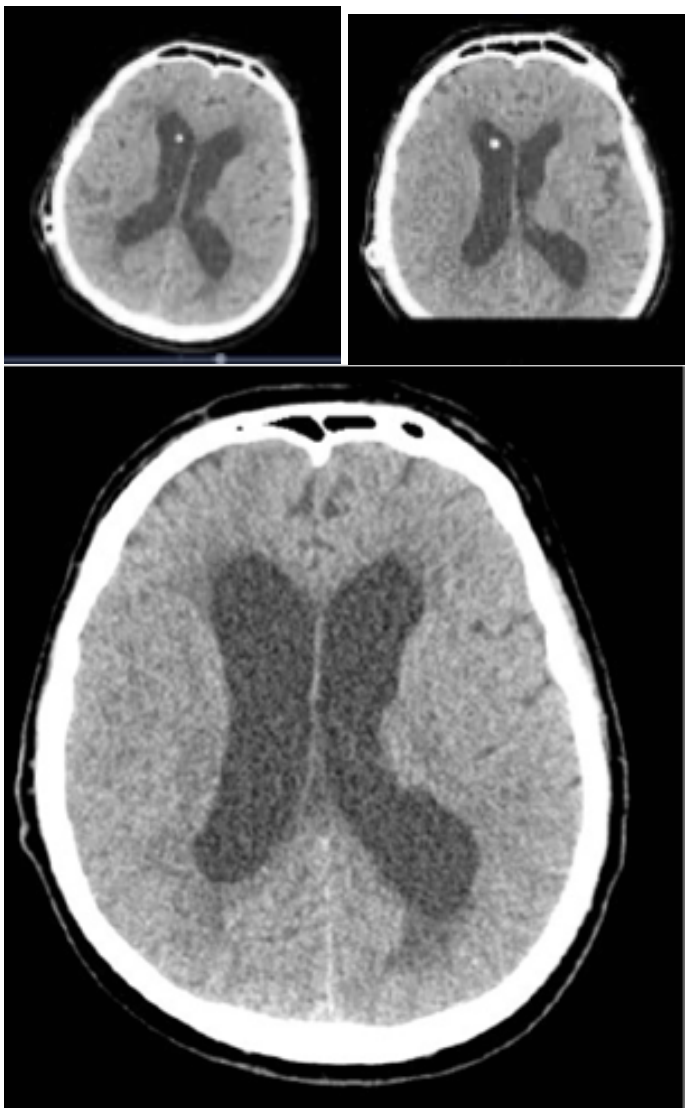
Methods: A comprehensive review was conducted which included available scientific literature from internet databases (MEDLINE, PubMed, Embase, ClinicalTrials.gov) where 23 papers published in the period from 1983 to 2023 were analyzed together with references and relevant conference abstracts. Moreover, the authors focused on case reports and studies discussing lumbar spinal abscess and associated complications.

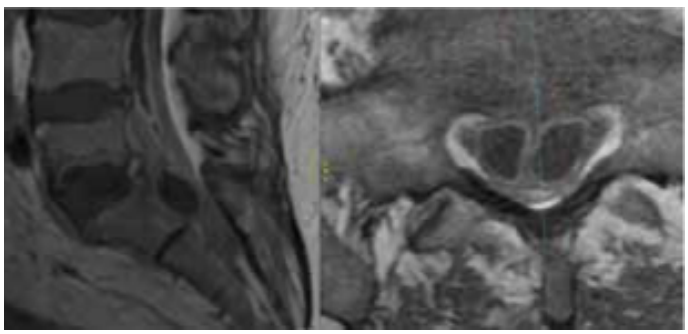
Results: The review emphasizes the importance of neurological deficits in indicating the occurrence of a spinal epidural abscess, since the diagnostic workup of a patient with a spinal abscess is usually carried out after the onset of a new neurological deficit. Furthermore, a detailed and comprehensive radiological assessment of neuraxis is necessary in patients with atypical symptoms of an acute hydrocephalus. On the other hand, the anatomical specificities of the cervical spine can contribute to the obstruction of the cerebrospinal fluid flow and cause hydrocephalus. Some researches emphasize the advantages of surgical decompression and evacuation of the abscess with subsequent antibiotic therapy, pointing up that late surgery leads to a worse neurological outcome. Conservative treatment alone, however, may lead to unfavorable outcomes.

Conclusion: This case-based literature review focuses on a rare complication of the lumbar epidural abscess, hydrocephalus, while emphasizing the importance of the early diagnosis and operative treatment. Although conservative treatment may be considered in certain scenarios, timely surgical decompression and evacuation of the abscess, along with the antibiotic therapy, remains the mainstay of treatment for the spinal epidural abscesses.

Keywords: Spinal epidural abscess; Hydrocephalus; Discitis; Surgical decompression.







198 PAPILLOEDEMA IN THREE VENTRICLE HYDROCEPHALUS

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Introduction: Hydrocephalus is a clinical condition characterized by enlargement of the cerebral ventricles. In addition to numerous neurological disorders, the most common consequence of hydrocephalus is the development of edema and secondary atrophy of the papilla of the optic nerve.

Aim: To determine the changes in the papilla of the optic nerve after drainage surgery in three ventricle hydrocephalus.

Case presentation: A 22-year-old patient, without significant previous illnesses, was hospitalized due to headaches and nausea. The neurological findings were within normal limits. Ophthalmological findings showed a papillary path of prominence 1 Dp with peripapillary hemorrhages. NMR and CT of the head showed tree ventricle hydrocephalus. The patient underwent drainage intervention - ventriculostomy. Postoperative ophthalmological findings showed regression of papillary stasis and resorption of peripapillary hemorrhage.

Conclusion: Neuro-ophthalmic examination and early detection of papillary stasis in hydrocephalus, as well as timely treatment, are effective in preventing the progression of papillary stasis and the development of optic nerve atrophy.

Keywords: Hydrocephalus, Ventriculostomy, papilloedema

199 ACUTE COMPLICATIONS OF PRE-RESECTION CSF DIVERSION IN POSTERIOR FOSSA TUMORS WITH HYDROCEPHALUS

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Study background and significance: Posterior fossa tumors are a common pathology worldwide and often present with obstructive hydrocephalus. In the year 2021 CSF diversion for acute hydrocephalus from brain tumors was the most common performed emergency procedure in Tikur Anbessa hospital. It is a clinical dilemma choosing the mode of management for the hydrocephalus as it could be a lifesaving procedure but with a risk of unfortunate and devastating outcome.

Objective: The aim of the study will be to evaluate the acute complications that occur with CSF diversion procedures that are done for obstructive hydrocephalus in the presence of posterior fossa mass before tumor resection.

Method: A prospective observational study conducted at Tikur anbessa specialized hospital, held from March 2021 up to October 2022. The research involved all patients who have undergone CSF diversion procedure for obstructive hydrocephalus from posterior fossa tumors prior to tumor resection and patients were followed for the first 48 hours post operatively. Patient's presentation, nature of the posterior fossa tumor on imaging, post-operative clinical status and post op imaging was taken to account.

Result: In the study time frame of 18 months there were 89 patients who came with acute obstructive hydrocephalus from posterior fossa of which all underwent CSF diversion procedure before tumor resection. 52.8% were pediatrics and 47.2% were adults. The most common tumor location was vermian (31.5%) followed by cerebellar hemisphere (29.2%), 4th ventricular (25.8%) and the rest 9% account for cranial nerve and extra axial location. The largest tumor was 9.8cm but the median was 5.1cm. Based on the size they were categorized in to 3 groups, 71.9% were tumor size 4-6cm, 22.5% had a tumor size of >6cm and there were 5.6% with tumor size <4cm. Of the CSF diversion procedures performed 93.3% were VPS, EVD and ETV account for 3.4% each. All were followed for 48 hours post op and 8 patients had clinical deterioration after CSF diversion was done, and all patients with clinical deterioration underwent urgent non-contrast CT scan. They were found to have upward herniation, intra-tumoral bleeding, intraventricular hemorrhage or a combination of these findings. Of the 8 patients that deteriorated 5 died without successful resuscitation. The rest 3 improved and underwent definitive surgery. The risk for postoperative deterioration was 8.9% and 48-hour mortality was 5.6%. Variables were chosen to check association with the outcome (post-operative deterioration). Variables tested include age of the patient, tumor size and tumor location, all did not have statistically significant relationship with outcome (post-operative deterioration and 48-hour mortality). The association between the type of intervention and outcome could not be checked as there were not enough samples representing ETV/EVD performed, and majority (93.3%) were VPS.

Conclusion: Through our research we tried to investigate the causes of acute deterioration after CSF diversion done for obstructive hydrocephalus from posterior fossa tumors by assessing the tumor size, location the type of intervention. Through our research we were not able to find any association from investigated factors and post-operative deterioration. Because of our limitation (the low number of sample size and not having enough number of ETV and EVD in the study population) we recommend further research is needed to have more information in this problem.

Keywords: Posterior fossa tumors; obstructive hydrocephalus; Upward herniation

200 NATURAL HISTORY OF SUPRATENTORIAL LOW-GRADE ASTROCYTOMA

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Introduction: Low-grade astrocytomas comprise a group of primary brain neoplasms with relatively low anaplastic potential, although through time they tend to behave more aggressively. They have a very heterogeneous natural course and clinical behavior.

Case: This report presents a natural history of a patient with low grade astrocytoma. A 32-year- old male sustained head injury after grand mal seizure. On admission, he was conscious and without neurological deficit. Initial computerized tomography and magnetic resonance of brain revealed oval, 4 cm in diameter, lesion in the left parietal region that was considered as low-grade glioma. The patient refused surgery. Eight years and four months later, he was readmitted. This time, he was subcomatose with right hemiplegia. Repeated computerized tomography showed huge tumor in the left frontoparietal region at the site of previous lesion. Urgent left frontoparietal craniotomy and reduction of tumor were performed. The patient recovered after surgery. Right hemiparesis remained.

Result: The described patient with low-grade astrocytoma lived without any oncological treatment eight years and four months from the time when diagnosis was made until intracranial herniation.

Conclusion: The natural history of disease in presented patient indicated that rational therapeutic strategy, for low-grade astrocytoma with epilepsy only, would be deferral of surgery until the time of manifestation of neurological or radiological deterioration.

Keywords: Low grade astrocytoma, Oncology, Operative managment

201 INTRAOPERATIVE 5-ALA FLUORESCENCE GUIDED RESECTION OF HIGH GRADE GLIOMAS IN UNIVERSITY CLINIC FOR NEUROSURGERY SKOPJE

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Introduction: High grade gliomas are the most common type of primary malignant brain tumors in adulthood. The usage of 5-aminolevulinc acid (5-ALA) fluorescence guided resection improves the extent of surgical resection in patients harbouring high grade gliomas and thus provides longer progression free and overall survival.

Material and methods: The primary objective of this study was to assess the extent of resection achieved using 5-ALA fluorescence guidance. We evaluated the demographic characteristics of the patients, localisation and side of the tumour, neurologic deficits on admission, postoperative new neurologic deficits, Karnofsky performans score on admission, resection rate and progression free survival. All the patients were with newly diagnosed HGG.

Results: Of the 15 cases included in this study, 7 (46.7%) were male and 8 (53.3%) were female. The distribution of high-grade gliomas based on location revealed 4 (26.7%) cases in the temporo- insular region, 3 (20%) in the frontal region, 2 (13.3%) in the fronto-temporal region, 3 (20%) in the parietal region, and 3 (20%) in the occipital region. Eight patients with HGG (53.3%) were located on the right side, while 7 (46.7%) were on the left side. Regarding the neurologic status on admission, it was found that 9 (60%) patients had symptomatic headaches prior to admission, 5 (33.3%) patients presented with hemiparesis, 4 (26.7%) patients had symptomatic epilepsy, and 2 (13.3%) patients exhibited quadrantanopsia. In terms of the Karnofsky Performance Score (KPS) on admission, 2 (13.3%) patients were admitted with a KPS of 50%, 4 (26.7%) patients had a KPS of 70%, and 9 (60%) patients had a KPS over 80%. Gross-total resection (GTR) was achieved in 83% of the cases, as confirmed by volumetric MRI performed one month postoperatively. In only 13% of the cases was a subtotal resection observed. In this cohort we didn't observe any new postoperative neurologic deficits. Additionally, the 12-month progression-free survival rate was found to be 93%, suggesting favourable long-term outcomes.

Conclusion: In conclusion, intraoperative 5-ALA fluorescence-guided resection proves to be a reliable technique for visualising the malignant tissue and obtaining better surgical resection. This study demonstrates a high rate of gross-total resection (83%) and favourable progression- free survival outcomes (93%), highlighting the effectiveness and safety of this approach. The findings support the integration of 5-ALA fluorescence guidance into the surgical management of high-grade gliomas, ultimately improving patient outcomes.

Keywords: 5-aminolevulinc acid, fluorescence guided surgery, high grade glioma

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202 SURGICAL TECHNIQUE AND COMPLICATION AVOIDANCE IN PATIENTS WITH SUBEPENDYMAL GIANT CELL ASTROCYTOMA-35 YEARS OF EXPERIENCE IN CLINIC FOR NEUROSURGERY BELGRADE

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Introduction: The goal of this study is to analyze surgical technique and complications of subependymal giant cell astrocytomas (SEGAs) surgery in our institution between 1985. and 2020. and also to compare two groups of patients, before and after 2007.

Methods: We analyzed in retrospective manner clinical data of 27 patients operated between 1985-2007 y by several neurosurgeons in Clinic for Neurosurgery, Clinical Center of Serbia and compared them with 13 patient operated between 2007-2020 by a single surgical team, from Department of Neurooncology in the same institution. Demographic and clinical data before and after surgery, surgical approach, VP shunt placement, and surgical complications were analyzed.

Results: Between 1985 and 2007, 27 patient were operated, 14% presenting with hemiparesis and 11% with intraventricular hemorrhage. Between 2007 and 2020, 13 patients were operated, and none of them had hemiparesis or intraventricular hemorrhage before surgery. Hydrocephalus was present in more than 70% of patients in both groups. Most of the patients were pediatric, average 15y. Transcallosal approach was used on 70% of patient in first group and 100% in second group, and the complications occurred only in first group : venous infarction 7, 4%, intracerebral or intraventricular hematoma in 11, 1%, and meningitis in 7, 4%. Total resection was achieved in 77% in first group and 93% of patients in the second group. During the follow up, tumor progression was observed only after partial resection.

Conclusion: Surgery is a safe and effective treatment for SEGA in modern neurosurgical area. The cause of worse results in the first group is late diagnosis, with large percent of patients presenting with hemiparesis and intraventricular hemorrhage. Statistical analysis showed better results with transcallosal approach, but the number of operated patients is too small for definite conclusions. In patients in good neurological condition, surgery offers excellent and long standing local control, with minimal surgical risk.

Keywords: Surgery, subependimal giant cell astrocytoma, complication

203 VOLUME DYNAMICS OF SUBTOTALLY RESECTED BENIGN BRAIN TUMORS

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Introduction: 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, the 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).

Conclusion: 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.

Keywords: Subtotal tumour resection; residual brain tumour

204 PREMATURE MORTALITY DUE TO CENTRAL NERVOUS SYSTEM MALIGNANT TUMOR IN THE WESTERN BALKANS COUNTRIES: GLOBAL BURDEN OF DISEASE DATA FROM 1990. TO 2019.

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Introduction: Central nervous system (CNS) malignant tumor can be localized almost anywhere in the CNS but predominantly affects the brain of children and adults. It can be a significant cause of premature mortality and a burden to the health systems due to their complex management and poor health outcomes. Estimating the disease burden can help raise awareness and allocate more resources to highly specialized centers for the management and care of CNS malignant tumor patients.

Methods: Our study included data on age-standardized Years of Life Lost (YLL) and incidence rates per 100, 000 for central nervous system malignant tumors between 1990. and 2019. in the Western Balkans countries (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia). Our analysis also considered the annual rate change in these rates from 1990. to 2019. All data was gathered from the IHME Global Burden of Disease Study.

Results: The highest age-standardized rate for Years of Life Lost (YLL) due to CNS cancer both in 1990. and in 2019. was in Montenegro with 297.81 (95% CI: 371.73-253.20) and 250.58 (95% CI: 321.91-192.04), respectively. The incidence of CNS cancer in the observed period was the highest in Montenegro and Serbia. The age-standardized incidence rate in 2019. was 8.98 (95% CI: 11.33-6.91) in Montenegro and 8.81 (95% CI: 11.35-6.23) in Serbia. The highest annual rate of change in the age-standardized incidence and YLL rates for the observed period was in Albania, measuring 0.42 and 0.22, respectively.

Conclusions: Between 1990. and 2019., the age-standardized incidence rate for CNS malignant tumors increased in many Western Balkans countries. In 2019., the age-standardized YLL rate was the highest in Montenegro and the lowest in Serbia. Further research and analysis are required considering this region's high premature mortality due to CNS cancer compared to global and European estimates.

Keywords: central nervous system malignant tumors; premature mortality

205 SUPRATOTAL RESECTION - AN EMERGING CONCEPT OF GLIOBLASTOMA MULTIFORME SURGERY - SYSTEMATIC REVIEW AND META-ANALYSIS

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The severe neurological tumor known as glioblastoma (GBM), also referred to as a grade IV astrocytoma, is rapidly progressive and debilitating. Supratotal resection (SpTR) is an emerging concept within glioma surgery, which aims to achieve a more extensive resection of the tumor than is possible with conventional techniques. We performed a language-independent search of PubMed, Scopus, and Cochrane CENTRAL to identify all available literature up to August 2022 of patients undergoing SpTR assessing survival outcomes in comparison to other surgical modalities. After screening for exclusion, a total of 13 studies, all retrospective in design, were identified and included in our meta-analysis. SpTR was associated with significantly increased overall survival (HR=0.77, [0.71-0.84]; p<0.01, I2=96%) and progression-free survival (HR=0.2, [0.07-0.56]; p=0.002, I2=88%).

Keywords: Glioblastoma; Supratotal resection; Supramarginal resection; Astrocytoma; Supra complete

206 LOOKING TOWARDS PERSONALISED GLIOBLASTOMA TREATMENT – WILL WE GET THERE?

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Glioblastoma (GBM) is the most common primary malignancy of the brain, and it is the most aggressive glial tumor of the central nervous system (CNS). Despite significant scientific efforts to better understand molecular and genomic landscape of GBM, patients diagnosed with this disease generally have poor outcomes. Median survival of untreated patients is about 3 to 4 months, whereas patients treated with the current standard-of-care regimen have a median survival of approximately 15 months. Currently, first-line treatment consists of surgery, concomitant radiochemotherapy, and maintenance chemotherapy. Sadly, this approach still fails to significantly improve outcomes, but patient-tailored approaches could be a novel avenue worth exploring. The main goal of surgical treatment is maximal safe resection and supramarginal resection is desirable, if possible. However, even supramaximal resection could be redefined with modern technologies and radiographic imaging, such as artificial intelligence (AI). Current radiotherapy (RT) regimen uses predetermined margins, although recent studies suggest that malignant cells do not invade surrounding brain tissue in a uniform manner. Therefore, better defining areas of the brain which are likely invaded by malignant cells is an important task. Interestingly, machine-learning (ML) frameworks combined with multimodal imaging could result in personalised RT regimen with potentially better outcomes. Furthermore, chemotherapeutic agents can also be administered depending on the genetic signature of GBM. Other treatment options are also investigated, such as tumor-treating fields, vaccine-based immunotherapies, oncolytic viral therapy, and others.

The most recent WHO classification of CNS tumors combined histological and genetic characteristics of these neoplasms. Determining mutations which could be leveraged for specific treatment is an important task – next generation sequencing, whole-exome sequencing, and whole-genome sequencing will likely have a major impact on GBM treatment personalisation. It should be noted that metabolic pathways are still relatively underutilised when characterising GBM. Therefore, technologies such as imaging mass spectrometry could play a major role in designing therapeutics in the near future. In conclusion, although personalised GBM treatment still seems far away, technological improvements have set the foundation for scientific research which could improve the design of patient-specific treatment regimens.

Keywords: glioblastoma; chemotherapy; immunotherapy; personalised therapy; radiotherapy

207 PERSONALIZED 3D PRINTED CRANIOPLASTY

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Cranioplasty is a routine neurosurgery treatment used to correct cranial vault abnormalities. Utilization of 3D printing technology in the field of cranioplasty involving the reconstruction of cranial defects emerged as an advanced possibility of anatomical reshaping. The transformative impact of patient-specific 3D printed implants, focuses on their remarkable accuracy, customization capabilities, and enhanced biocompatibility. The biocompatibility of advanced 3D printed materials was evaluated, demonstrating encouraging results in terms of long-term implant integration and reduced risk of adverse reactions. The precise adaptation of implants to patient-specific anatomies, resulted in improved aesthetic outcomes and reduced surgical complications. The ability to create highly customized implants addresses the functional aspects of cranial defects and considers the psychological impact on patients. By combining technological innovation with personalized patient care, 3D printed cranioplasty emerges as a transformative avenue in cranial reconstruction, ultimately redefining the standards of success in neurosurgery.

We would like to present personalized cranial implants using 3D printing technology using open-source software in complex cranioplasty cases. Advantage of personalized 3D printed bone prosthesis is its excellent adjustment to the defect of the cranial vault which results with a high cosmetic outcome. Besides restoring anatomical shape, cosmetic effect and time-sparing surgery, the time on patient care is also decreased with a possibility of quicker recovery and hospital discharge.

3D printing allows an excellent cranioplasty cosmetic effect achieved at a reasonable price without sacrificing patient outcomes. Wider implementation of this strategy can lead to significant healthcare cost savings.

Keywords: cranioplasty; decompressive craniectomy; polyetheretherketone; three-dimensional printing

208 ANTERIOR SKULL BASE DEFECTS: OUR EXPERIENCE IN ENDOSCOPIC SURGERY

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Introduction: This article discusses the experience of the Department of Otorhinolaryngology at Burdenko National Medical Research Center for Neurosurgery in endoscopic surgery for closing defects and removing sinonasal neoplasms in the skull base area. A total of 1060 operations have been performed, focusing on the closure of defects of various etiology and localization. Indications for surgical treatment were nasal liquorrhea, meningocele, recurrent meningitis, and pneumocephalus. Spontaneous defects were the most common, followed by defects caused by heart injuries, neurosurgical and ENT operations, and congenital basal defects in children.

Methods: All defects that could be closed through endoscopic procedures were classified topographically based on the location and structure of the paranasal sinuses. The access and technique for each type of defect were determined, as well as the appropriate plastic materials used for successful closure.

Results: The cribriform plate defects were accessed by shifting the middle and superior nasal turbinates laterally. A hemostatic material or fascia lata was placed behind the defect edges, and a nasoseptal flap was used when necessary. Access to the roof of the ethmoid labyrinth involved displacing the middle and superior nasal turbinates medially to the nasal septum. The uncinate process and ethmoid bulla were removed, and the anterior and posterior ethmoid cells were opened. Standard plastic surgery was performed, with a middle nasal turbinate flap utilized for major defects. Medially located defects of the posterior wall of the frontal sinus were closed using endoscopic access Draf IIA, B, while lateral defects were closed through external access with an incision along the eyebrow. Defects in the body of the sphenoid sinus were closed via the transsphenoidal approach, and the lateral recesses were accessed using the transpterygopalatine approach. The nasoseptal flap was identified as the most reliable plastic material for closing defects in the sphenoid sinus. Multiple defects were closed using a single mucoperiosteal flap for one-sided locations, and each defect was closed separately for two-sided locations.

Conclusion: The relapse-free survival rate of patients after treatment reached 0.92. Pneumocephalus, the presence of meningoencephalocele, brain damage in neurosurgical patients, and the use of fat as a plastic material were identified as risk factors for recurrence. Lumbar drainage in the postoperative period did not affect the surgical treatment results. The risk of developing inflammatory complications was associated with a history of meningitis, the use of fat as a plastic material, and pneumocephalus. Follow-up data demonstrated a high quality of life in patients after endoscopic closure of defects, with an average Karnofsky Performance Status of 94% in the near and distant postoperative periods.

Keywords: endoscopic surgery; skull base defects; plastic materials, closure techniques.

209 WITHIN THE DEPTHS OF THE MIDBRAIN: EXPLORING THE "NO-MAN'S LAND"- A CASE REPORT

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Introduction: Brainstem tumors are rare lesions located in a very complex region. They are more commonly encountered in children and when it comes down to adults, they represent only 1-2% of all brain tumours. Out of those, only 12-15% of cases are located at the level of the midbrain.

Case: We present the case of 50 y.o. male that came at our institution with left-sided motor deficit. He did not present with any other signs or symptoms at the time of admission. On the MRI, a mass was seen at the level of the brainstem, on the right side of the midbrain. Intraoperatively, the tumor was revealed via a subtemporal approach and total removal of the mass was obtained. The post-op control CT scan confirmed the total resection of the mass. After the surgery, 3rd nerve palsy was observed. The histopathology report is still in the works at the time of submission of this abstract. The patient post-op evolution is favorable and is awaiting discharge from our hospital in the coming days.

Conclusion: Once deemed uniformly fatal, and the location being labelled as "No-man's land", with the progress seen in the field of neurosurgery, the excision of brainstem tumours still requires a great level of skill and courage, but it has now been approached, resulting in improving outcomes as shown also by this case. The "No-man's land" has now, a few surgeons untangling its mysteries.

Keywords: Brainstem surgery; Midbrain tumor; Neurosurgery;

210 INTRAVENTRICULAR TUMORS: NEW TRENDS, FUTURE PERSPECTIVES AND SURGICAL STRATEGIES

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Introduction: Intraventricular tumors represent a minority in the context of brain tumors, but their treatment is particularly complex, due to the vascularization and their often deep localization. The characteristics of these tumors make them ideal candidates for mininvasive endoscopic surgery, which is one of the most widely used techniques for resection of these lesions; however other surgical options, or combined approaches, must also be considered, especially for larger and third-ventricle tumors.

Materials and Methods: Forty-three patients with intraventricular lesions underwent surgical treatment at our institution from 2013 to 2021 were selected. In 21 patients we used the pure endoscopic approach both trans parenchymal and transcallosus; in 7 patients we used the supra- orbital trans-laminaterminalis micro-endoscopic approach, in 7 patients the transcallosal micro- endoscopic approach and in 8 patients the neoplastic resection was achieved through the use of a neuronavigated tubular. The following data were collected for each of them: age, sex, pre and post-operative imaging, onset and clinical outcome.

Results: In our series 13 patients were affected by colloid cyst, 13 by intraventricular meningiomas, 5 by dermoid cyst, 5 by metastasis, 3 by craniopharyngioma and 4 by chorioid plexus papilloma. In 9 patients the finding was occasional, while in 6 patients the clinical presentation occurred with seizures, 4 experienced dizziness, in 3 patients the disease started with acute hydrocephalus and in 8 with behavioral disorders. A macroscopically complete resection was achieved in 37 cases. The micro-endoscopic approach was found to be the fastest and the one related to the greatest possibility of complete resection. CSF fistula occurred in 3 patients while surgical wound dehiscence was found in 2 and intraventricular haemorrhage was observed in 1.

Conclusions: Our experience suggests that the use of endoscopy, both in pure and combined form, in intraventricular neoplastic pathology has revolutionized clinical practice. However, it can be modulated and included in a broader philosophy of minimally invasive surgery, together with the "more classic" approaches, in pure and / or combined form, in order to select the direct and safest surgical corridor and to reduce the direct manipulation of the brain parenchyma and optimize the surgical resection.

Keywords: skull base; intraventricular tumors; endoscopy; minimally invasive surgery

211 EPIDURAL EXTENDED FRONTOTEMPORAL APPROACH FOR GIANT OLFACTORY MENINGIOMAS

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Introduction: Giant olfactory meningiomas are often associated with edema of the frontal lobes and chronic high intracranial pressure. Opening the dura above cortex may lead to serious bulging of the brain which complicates further dissection.

Thorough epidural dissection along the frontal skull base towards the tumor base, opening the dura above tumor tissue rather above the cortex, and tumor debulking from the epidural space should be appropriate to avoid bulging of the brain and facilitating low-risk tumour resection.

Methods: From 2018 to 2022, 6 patients harboring olfactory meningiomas exceeding 5 cm in diameter were operated through a frontotemporal craniotomy with epidural drilling along the frontal skull base, orbital roof, dissection of the meningoorbital band and drilling of the base of the anterior clinoid process. Tumor resection was started from the epidural center of the olfactory groove until significant debulking was achieved and the brain became slack. Then, a second dural opening was done over the sylvian fissure for completion of tumor removal.

Results: Epidural access to the olfactory groove was possible in all patients. Dissection of the meningoorbital band added significant epidural working space under the frontal lobe. Tumor resection starting from the epidural olfactory groove site allowed extensive tumor debulking which resulted in slackness of the brain. No bulging of the brain was observed in all patient after dural opening above the brain cortex. All tumors could be completely resected without morbidity.

Conclusion: For giant olfactory meningiomas, epidural dissection along the frontal skull base and tumor debulking from the epidural olfactory groove site after frontotemporal craniotomy is a suitable concept to avoid bulging of the brain at the cortical dural incision site.

Keywords: Olfactory Meningioma, Epidural Approach

212 RELIABILITY OF NEURONAVIGATION IN LOCALIZING THE INTERNAL AUDITORY CANAL DURING MIDDLE FOSSA APPROACH

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Introduction: The middle fossa approach (MFA) enables a direct route to the internal auditory canal (IAC) and its contents as well as the petroclival area and the anterolateral margin of the brainstem. The MFA has advantages of being not obstructed by the cerebellum and having a shorter course compared to retro- and presigmoid approaches. However, the MFA poses a significant challenge for skull base surgeons due to several factors such as absent landmarks, target structures buried in the bone, and possibility of damaging unforgiving neural, vascular, and neuro-otological structures. Thus, neuronavigation system (NNS) became an indispensable tool in skull base surgery to recognize related structures. However, application of NNS during the MFA was rarely studied in the literature. The purpose of this study is to investigate the reliability of NNS in MFA and to define specific technical considerations.

Methods: Five formalin-fixed human cadavers (10 sides) were used in this study. Computed tomography scans were obtained to use with neuronavigation. The MFA aiming to expose the IAC was performed in all sides by the guidance of neuronavigation.

Results: The accuracy of NNS was verified on coronal and squamous sutures. The foramen ovale (average radius: 6.87 mm. min: 1.87 mm. max: 8.57 mm) and the foramen spinosum (average radius: 3 mm. min: 1.8 mm. max: 4.7 mm) were recognized after elevation of the dura from skull base. (Figure 1) Neuronavigation showed no deviation in determining these structures. (Table 1) However, the NNS failed to demonstrate the IAC by pointing the probe over the expected spot. (Figure 2A) In order to investigate the possibility of the NNS shifting as the dissection headed deeper, we drilled the roof of the IAC by determining its localization with anatomical landmarks. Drilling the lateral most point of the IAC (average radius: 3.5 mm. min: 2.82 mm. max: 4.14 mm) between the vestibule and the basal turn of cochlea exposed the contents of the IAC. Then, the NNS probe was introduced into the IAC while an imaginary line was added to the tip of the probe with the NNS software to project the orientation of the probe until the medial end of the IAC (average radius: 4.9 mm. min: 3.3 mm. max: 6.08 mm). (Figure 2B) This maneuver revealed the direction of the IAC in all hemispheres. The roof of the IAC then drilled in a medial to lateral fashion. The NNS was showing correct place of the IAC once the entire length of the IAC was opened. This proved the NNS does not shift as the dissection deepened.

Conclusions: The reason for the NNS was unable to reveal the IAC was thought to be due to two factors: First, the bone with varying thickness over the IAC hinders to pinpoint the canal in a 3D environment. Second, the IAC does not overlap with only one of the axial, coronal, or sagittal plane at the neuronavigation. Therefore, a thorough knowledge of the microsurgical anatomy seems to be still the best reliable method of localizing the IAC during MFA.

Head 1 R Head 1 L Head 2 R Head 2 L

Head 3 R Head 3 L Head 4 R Head 4 L Head 5 R Head 5 L

FO FS 6, 9 3, 5 7, 4 4, 18 8, 57 4, 73 7, 81 2, 35

7, 36 1, 76 1, 48 2, 15 7, 15 1, 89 6, 02 2, 98 8, 39 3, 05 7, 64 3, 33

IAC lateral 3, 99 3, 51 2, 82 3, 11

3, 68 4, 08 2, 99 3 4, 14 3, 97

IAC medial 5, 24 4, 85 5, 15 5, 18

5, 9 6, 08 3, 3 3, 68 4, 61 5, 33

Table 1: FO: foramen ovale; FS: foramen spinosum;

IAC: internal auditory canal; L: left; R: right.

Figure 1: Cadaveric dissection of a right sided middle cranial fossa. A. Elevating the temporal lobe dura from the middle fossa surface reveals initially the foramen spinosum and middle meningeal artery exiting from this foramen. The ophthalmic nerve enters to the superior orbital fissure, the maxillary nerve to the foramen rotundum, and the mandibular nerve to the foramen rotundum. The greater superficial petrosal nerve (GSPN) and the internal carotid artery are situated at the lateral margin of the petrous ridge. B. The petrous bone was drilled to reveal the internal auditory canal (IAC), meatal and labyrinthine segments of the facial nerve, and the geniculate ganglion. The labyrinthine segment coursing within the meatal foramen joins the geniculate ganglion. The GSPN originates from the geniculate ganglion and courses anteriorly at the middle fossa floor lateral to the internal carotid artery. The basal turn of the cochlea is located anteromedially to the fundus of the IAC, at the angle between the GSPN and the labyrinthine segment of the facial nerve. The arcuate eminence is associated with the superior semicircular canal. C. The arcuate eminence and semicircular canals were removed. The tegmen tympani was removed to expose the tympanic segment of the facial nerve. The tympanic segment originates from the geniculate ganglion and courses within the tympanic cavity. (CN: cranial nerve, For.: foramen, GG: geniculate ganglion, GSPN: greater superficial petrosal nerve, ICA: internal carotid artery, Mand.: mandibular, Max.: maxillary, N.: nerve, Oph.: ophthalmic, Pet.: petrous, Seg.: segment, Sup.: superior, Tent.: tentorium)

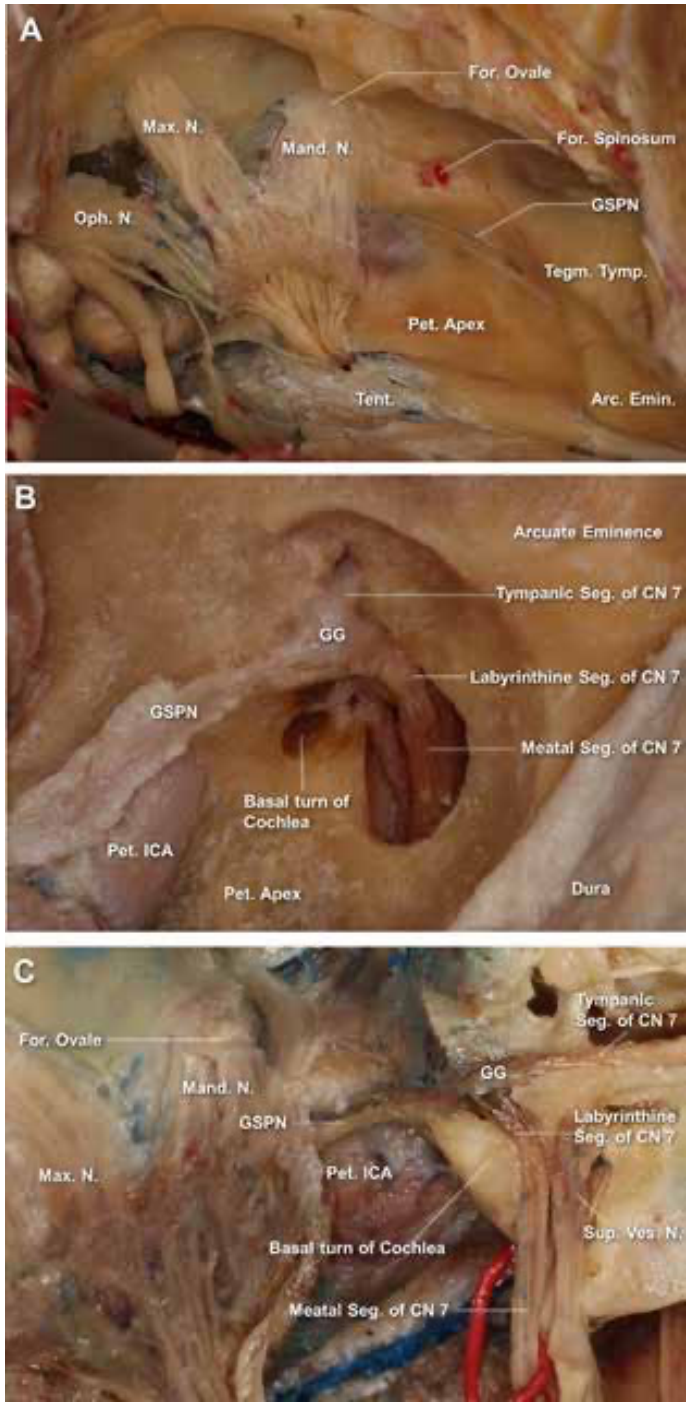
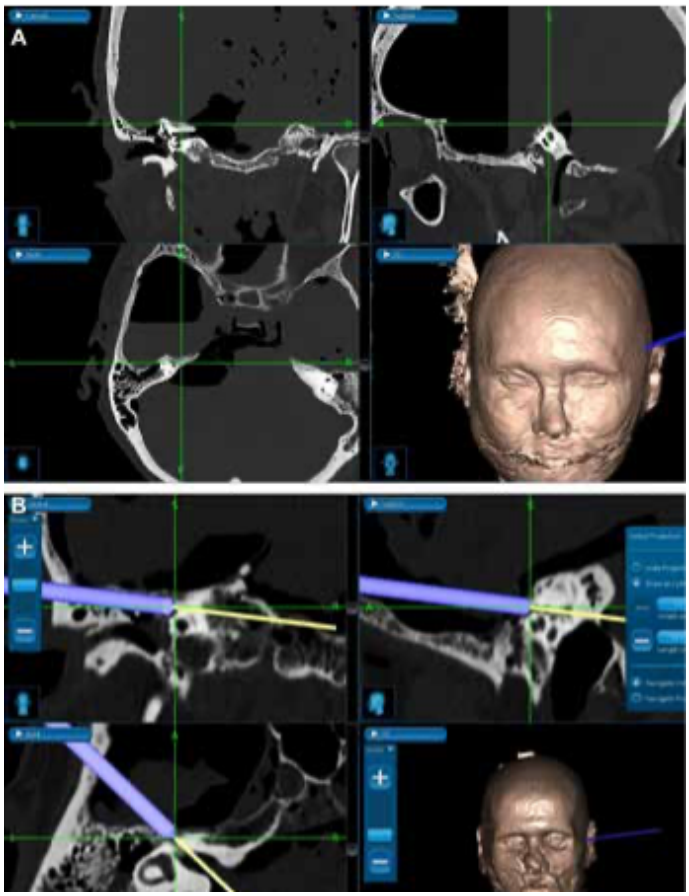


Figure 2A; Figure 2B.

Figure 2: A. The neuronavigation probe placed over the expected spot of the internal auditory canal (IAC) failed to demonstrate the direction course of the IAC. B. The lateral end of the IAC between the vestibule and the basal turn of cochlea was drilled and the neuronavigation probe was introduced into the IAC with an imaginary line added to the tip of the probe. This maneuver revealed the direction of the IAC in all hemispheres.



Keywords: skull base; middle fossa approach; neuronavigation; neuroanatomy; facial nerve; internal acoustic canal

213 TWO-STAGED SURGERY WITH CAVITATION PRINCIPLE FOR HUGE BENIGN BRAIN TUMOR

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Introduction: Huge benign brain tumors have a tendency to displace surrounding tissues. Vital structures on the tumor surface like cranial nerves, arteries and veins are prone to mechanical stress and damage during surface dissection, ultimately leading to bleeding, infarction and neurological deficit.

Methods: In a personal series from 2018 to 2022, all benign brain tumors classified as huge (supratentorial 5 cm diameter, infratentorial 4 cm) with displacement of critical structures were planned for a 2 stages surgical resection principle with at least 3 months time between both procedures. In the first surgery, a safe circumscribed area of tumor surface was exposed. From there, the tumor was hollowed extensively ("cavitation principle") without exposing more tumor surface, and aiming to remove at least 60 % of outer tumor volume. A postoperative MRI was done in the first week and after 3 months to assess the tumor residual. Then the second surgery was planned for completion of tumor resection.

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. 60% of outer surface tumor volume reduction was seen on average on the first postoperative imaging. After 3 months, further volume reduction of another 50% was observed on imaging follow-ups. 13 patients underwent the second stage operation from 3 to 15 months. 4 refused further surgery due to well-being. In all cases the second stage operation was significantly shorter than the first operation and dissection of vessels, cranial nerves and other vital structures along the tumor surface could be done safely. In all cases there was no morbidity nor mortality.

Conclusion: For resection of huge benign brain tumors, a 2 stages resection with extensive tumor cavitation during the first operation avoiding surface dissection as much as possible and a second stage operation several months later for completion of tumor resection appears to be a very suitable and safe principle.

Keywords: 2 stage surgery, cavitation principle

214 SURGICAL RESULTS OF ENDOSCOPIC ENDONASAL TRANSSPHENOIDAL SURGERY FOR PITUITARY ADENOMA WITH SPECIAL FOCUS ON COMPLICATION RATE

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Objective: The study's purpose was to assess the results of endoscopic transsphenoidal surgery for pituitary adenoma with a particular focus on complication rate.

Methodology: A retrospective study was undertaken at the Hayatabad Medical Complex/MTI/ Peshawar, Pakistan's Department of Neurosurgery. Pituitary adenomas were detected through MRI and biopsies from 45 patients with tumors. The outcome of the surgery, as well as any complications, were recorded.

Results: There were 55.5% male and 44% female patients out of 45 cases. The average age was 42 years and five months. The most prevalent presenting complaint was headache (91%). The surgical outcome was good in microadenomas and macroadenomas (83% vs 65 %). In total, 76% of patients experienced early surgical symptom relief. Seventy-six percent of our patients reported immediate symptom reduction following surgery. CSF rhinorrhea 5(11%) was the most common complication. In 50% of the patients, a gross total resection was achieved.

Conclusion: Pituitary adenomas are treated by endoscopic endonasal transsphenoidal surgery, which had an acceptable postoperative consequence.

Keywords: Endoscopic Endonasal Transsphenoidal Surgery (ETSS), Pituitary Adenoma, Complication

215 THE CASE REPORT OF AN ADENOCARCINOMA BRAIN METASTASES IN HIPPOCAMPAL AREA

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Introduction: Brain metastases are the most common intracranial tumors in adults. The prognosis remains extremely poor. Without treatment, median survival is estimated at 1 month. Even with treatment, the patients with the best prognostic factors have a median survival of 7 months, and the 2-year survival rate is less than 10%. Current treatment modalities include whole brain radiotherapy (WBRT), resection, stereotactic radiosurgery (SRS), and chemotherapy.

Case report: A 59-year-old man presented with a episode of losting a consciousness. On an examination he was confused, here was not another neurogical deficits, GCS 14. Because of that he did a KT image of head revealed expansive process located the deep next to temporal and occipital corn of the lateral ventricul on the right side. We recommended a Magnetic Resonance Image (MRI) to be done. MRI image with contrast revealed a metastatic brain tumor in hippocampal area on the right side. The patient underwent a right fronto-temporo-parietal craniotomy with temporal lobectomy and excision of the tumor. Post operatively there was no neurogical deficit. He was treated with antiepileptic therapy, an and a oncological tretament post-operatively. One follw-up KT shows no new changes, annual follow up MRI continues.

Neuropathology: The specimen obtained from parahippocampal lession reveald adenocarcinoma brain metastases.

Conslussion: Brain metastases are growths that spread to the brain from a cancer in another part of the body. They are distinct from primary brain tumors, which start in the brain. Brain metastases are also much more common.. Magnetic resonance imaging (MRI), computed tomography (CT) scan or both may be used to provide a diagnosis . In patients with many brain metastases, a chance for cure is unfortunately unlikely. However, brain metastases can be controlled, either temporarily or indefinitely, with treatments such as surgical resection, stereotactic radiosurgery, fractionated radiation and chemotherapy. Metastatic brain cancer is usually terminal. While some people are able to live longer than others and while a few survive much longer than average, most people have months to live by the time they receive a diagnosis.

216 MOLECULAR FEATURES IN SPORADIC AND NF2-INACTIVATED MENINGIOMA

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Meningiomas are previously bening tumours, however, in last time, a new date show that molecular features molecular features cause malignancy and clinical course. In 2021, Nassiri suggested classification based in molecular features. 4 prognostic classes were identified, while these classes are independent of Grade, and both Grade I meningiomas and high-grade tumors are found in each of the classes. For the first time, this classification based not only the mutational status, but also the type of mutation and its biological significance. Biallelic inactivation of Nf2 gene is also a negative prognostic factor affecting sensitivity to radiation treatment. Besides, target therapy for Nf2-schwannomatosis effective only for schwannomas and ependymomas treatment and does not affect the growth of meningiomas. In our pilot study we investigate the molecular features in Nf2-schwannomatosis and sporadic meningiomas.

30 meningiomas were included in the pilot study: 15 with biallelic inactivation of Nf2 gene and 15 sporadic tumours. The studies were carried out in the tumor tissue. we performed sequencing a panel of genes in all samples. The selection of genes was carried out based on literature. The genes panel included mTOR, EGFR, VEGF, MAP2K1, MAP2K2, AKT1, IGF1, KIT, ERBB2, ERBB4, PIK3CA, PAK1, PAK2. To identify pathogenic variants in interesting genes, targeted high-throughput sequencing was performed using Ion AmpliSeq amplification technology, AmpliSeq custom primer panel and Ion Torrent GeneStudio S5 sequencer (Thermo Fisher Scientific, United States). The bioinformatic workflow for sequencing data analysis was based on Torrent Suite software (version 5.12).

Pathogenic variants were detected in 14 patients and only in 4 patients with schwannomatosis . Driver mutations in AKT1, MAPK2, PAK1, ERBB2, IGF1R genes were found only in samples of patients with casual nonsense mutations in Nf2 gene and patients without biallelic inactivation. Patients with schwannomatosis and the identified variants had a statistically significantly higher number of tumors and a more severe course of the disease. In addition, different mutations were observed in different samples of these patients what may complicate the development of targeted therapy in this group of patients. In all samples of patients with sporadic meningiomas, one pathogenic variant was detected. Mutations in the AKT1 gene were detected in patients with a more favorable course of the disease and hyperostosis. The most unfavorable course of atypical meningioma with multiple repeated operations was observed in patients with mutations in the KIT gene. It has previously been shown that the expression of this gene increases in malignant peripheral nerve sheath tumor cells.

Thus, meningiomas in patients with schwannomatosis have molecular features different from sporadic meningiomas. In patients with the most severe course of the disease, other pathogenic variants may be detected, but it could be different in different meningiomas. These data may influence the choice of targeted therapy.

217 ROLE OF RISK FACTORS ON THE RE-BLEEDING RATE IN PATIENTS WITH ANEURYSMAL SAH. RETROSPECTIVE REVIEW OF OUR INSTITUTIONAL DATA REGISTRY

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Introduction: The aim of this study is to assess the risk factors that lead to the occurrence of brain aneurysms, as well as to define the risk factors for re-bleeding in patients with aneurysmal SAH.

Material and methods: We performed a retrospective data analysis from our institution PHU UC for Neurosurgery for 2020 to 2022. In all patients who were admitted due to aneurysmal SAH, the following parameters were examined – GCS score on admission, Hunt and Hess score on admission, Fisher score on admission, location and orientation of the aneurysm, presence or absence of intracerebral hematoma or intraventricular hemorrhage, need for external ventricular drainage, duration from admission to treatment, reSAH rate, type of treatment (endovascular or surgical), clinical outcome assessed by mRS (Modified Rankin scale).

Results: In the period from January 2020 to December 2022, a total of 385 patients with spontaneous aneurysmal SAH were admitted to our institution. 116 patients (30%) were treated surgically, and 242 patients (63%) were treated endovascularly. A higher rate of rebleeding was observed in the first 14 days from the initial presentation of spontaneous aneurysmal SAH (23.7%), which was associated with high blood pressure, Hunt and Hess score III-IV on admission, Fisher score IV on admission, presence of intracerebral or intraventricular hematoma, presence of an aneurysm of the posterior cerebral circulation, diameter of the aneurysm >10mm. According to the localization, the aneurysm site was presented as ACOM 30%, ICA 24%, MCA 33%, VA/ BA/PICA 13%. According to the mRS score for scoring clinical outcome and functionality, mRS score 1 had 30%, mRS score 2 had 41%, mRS score 3 11%, mRS score 4 and 5 18%.

Conclusion: The rate of rebleeding in patients with spontaneous aneurysmal SAH occurs more often in the first 6 hours to 14 days after the initial aSAH. Risk factors associated with rebleeding include high systolic blood pressure, presence of intracerebral or intraventricular hematoma on admission, low GCS score, Hunt-Hess score III-IV on admission, Fisher score IV on admission, aneurysm diameter >10 mm, localization of the posterior cerebral circulation of the aneurysm.

218 RADIOSURGERY FOR LARGE BRAIN METASTASES

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Brain metastases (BMs) are the most frequent intracranial malignancy, accounting for more than half of all intracranial tumors in adulthood. It is estimated that up to 40% of patients with cancer develop BMs, and the incidence of BMs seems to be rising continuously.

Treatment modalities for BMs include surgical resection (SR), whole brain radiotherapy (WBRT) and stereotactic radiosurgery (SRS), or their combination. Choosing the optimal treatment strategy must be tailored to each patient and clinical scenario independently.

While advancements in surgical technique and technology, adjuvant or upfront WBRT and/or SRS, made managing of the majority of BMs routine, large BMs in patients that are poor surgical candidates still represent a true challenge for both neurosurgeons and radiation oncologists, as treatment options become limited.

Rates of tumor control with fractionated radiotherapy are inversely related to tumor volume. Similarly, the risk of causing radiation adverse effects with SRS rise as the target volume increases, requiring a reduction of treatment dose. This led to single–fraction SRS being offered only to BMs of approximately 3 cm in diameter.

The aim of this presentation is to give an overview of radiosurgical treatment strategies to overcome this limitation.

Keywords: radiosurgery; metastasis; hypofractionation;

219 COMPUTATIONAL MODELING AND ARTIFICIAL NTELLIGENCE IN NEURAL TISSUE ENGINEERING

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There is a fundamental need for neurosurgery to produce clinically relevant, reproducible, and standardized human neural tissue models to implement in into everyday clinical practice.

It is necessary to design and make first in silico then in vitro construction of three-dimensional (3D) bioprinted neural tissues from different sources: native human-derived stem cells (e.g., neural stem cells) and human pluripotent stem cells (e.g., induced pluripotent).

In order to host stem cells the ideal neural scaffold requires not only reliable mechanical properties but also an elaborate guiding structure. It can be modeled and produced by the highly controlled flexible 3D printing methods. It is now reflected in various natural and synthetic hydrogels and polyester being developed with tailorable mechanical physical, chemical and biological properties as 3D printing inks to match the requirement of nerve regeneration.

3D printing technologies are leading to customized nerve therapies and drug delivery systems, which holds great promise for patient-specific healthcare, personalized medicine and precision medicine. 4D printed neural scaffolds may be developed using time scale as additional feature. The change comes from the stimulating factor, including temperature, pH, light stimulation, electrical stimulation, etc. After being implanted in human nerves, joints and other places, it can self-adjust with the bending or stretching movement to achieve a longer service life.

We developed physical based modeling approach for 3D and 4D printing optimization and pure Machine Learning for combination and optimization of neural tissue engineering. This coupled model is used then to explore the effect of different design elements such as microparticle shape, size, concentration, initial distribution, and viscosity of the drug solution on different scaffolds. An artificial neural network (ANN) is trained and tested to further predict the drug delivery results along with the proposed drug combination formula.

Among the tools of computer aided design of scaffolds, the finite element method (FEM) was singled out as an indispensable tool for modeling boundary and initial value problems characteristic for many physical processes related to scaffold functioning.

It has been concluded that there is a lot of potential for neurosurgery of using neural tissue models. Computer modeling and artificial intelligence can help in design and optimization of these models and future clinical using for neurosurgery everyday clinical practice.

Keywords: neural tissue engineering, computational modeling, artificial intelligence

220 EXTRACRANIAL METASTASES OF ATYPICAL MENINGIOMA

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Extracranial metastases of atypical meningioma are rare and poorly documented in the literature. We present a case of a 72-year-old patient who underwent surgical treatment for an atypical meningioma and later developed metastatic changes in the neck lymph nodes and lungs. The patient initially underwent surgical resection with Simpson grade 1, followed by postoperative radiation therapy.

However, local recurrence and distant metastases occurred. Literature review revealed limited data on similar cases, with only a few reported instances of atypical meningiomas with extracranial metastases. The majority of cases involve metastases to the lungs, while other sites include lymph nodes, liver, bones, and mediastinum. Surgical resection remains the primary treatment option for low-grade meningiomas, while high-grade lesions require a combination of surgery and adjuvant radiation therapy.

Treatment for metastatic meningiomas is challenging due to their rarity, and no standard approach has been established. Further research and clinical trials are needed to determine effective treatment strategies for metastatic meningiomas.

Keywords: atypical meningioma; metastases; lung; lymph node

221 TRANSNASALTRANSSPHENOIDALAPPROACH TO PITUITARY ADENOMAS AND SELLAR REGION. ENDOSCOPIC SURGICAL ANATOMY – HOW FAR CAN WE GO

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Objectives: To present the advantages and disadvantages of the transnasaltranssphenoidal endoscopic approach, including the applicable anatomy.

Background: The transnasaltranssphenoidal 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 and extension of the resection. The panoramic view afforded by the endoscope provided safe, more radical procedure, better bleeding control and lower complication rate.

Methods: We conducted retrospective/prospective study during the period of 2010-2022 which included 72 endoscopically treated patients. Tumors were classified according to the diameter, direction of growt and clinical outcomes were evaluated.

Results: The results demonstrated more efficacious and effective disease control among the patients treated with endoscopic technology, especially for secretory active macroadenomas. The extension of the resection, mostly GTR, provided by the endoscopic approach undouptedly contributed to better disease control, low complication rate, better ophthalmologic and endocrine outcome.

Conclusions: The endoscopic technique revealed statistically significant reduction in operative time and length of hospital stay, as well as more radical safe resection and complication control. Additionally, a trend toward improved endocrine outcomes and rate of correction of visual defects. This procedure is promoted as safe eloquent and efficious. In addition, the endoscopy with multilocularpolifilament 3D endoscope, facilitates extended approaches, reaching a delicate skull base lesions that are suprasellar, retrosellar, and parasellar region.

Keywords: Endoscopy, transsphenoidal, pituitary, adenoma

222 THE IMPORTANCE OF REGIONAL DEPARTMENTS IN THE CARE OF NEUROSURGICAL PATIENTS

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Introduction: This paper present the methodology and principles of work of Nerurosurgery Department of General Hospital Ćuprija in order to try to show importance of regional neurosurgery departments. Nerurosurgery department of General Hospital Ćuprija represent an important part of neurosurgical community of Serbia and contributes with consistent coverage of Pomoravlje region with 400 000 citizens. Nowadays, the department consist of tree medical doctors, 11 surgical and four OT nurses. The department has a independent operating theater with 12 hospital beds and intensive care unit.

Results: Annual average over the last 10 years of Neurosurgical Department indicates the average of 142 operations, 3207 ambulance examinations, with more than 81, 5% occupancy of department capacities (totaly 679 hospitalized patients per year). From the total number of hospital treatments, there were 36% trauma care patients and 42% patients with spinal pathology. In the remaining 22% of patients, there were predominanty neurooncolgy and peripheral nervous system pathology. The most frequently performed operative treatments were: 1) Lumbar Disc Herniation (55), 2) Chronic subdural hematoma (28), 3) Accute subdural hematoma (21), 4) Epidural hematoma (18), 5) Brain tumor (15), and 6) Peripheral nerve decompression (5). Good coordination during the operation between surgeons and the anesthesia department, as well as the good physical rehabilitation center, together have a significant role in the whole treatment and positive outcome.

Conclusion: The importance of regional neurosurgical departments is reflected in three main cases: 1) quick arrival to the hospital (more then 87% patients arrive during the , , golden hour'' from injury), 2) reduced number of patients in main centers, 3) economic profitability. Everything shown points to the indisputable importance of smaller and well distributed neurosurgical departments which indicates necessity of investment and maintenance into them.

Keywords: Regional departments, Golden hours, Neurosurgery department GHĆ

223 THE INFLUENCE OF INTRAOPERATIVE RUPTURE OF CEREBRAL ANEURISMS ON THE OUTCOME OF MICROSURGICAL INTERVENTION

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The treatment of intracranial aneurysms still remains to be a big neurosurgical challenge, whether it is microsurgical or endovascular treatment.

The study is about intraoperative ruptures of aneurysms during microsurgical intervention and the influence on the outcome of the treatment.

The study analysed 536 patients in which has been occurred rupture of the aneurysm during the intervention. The frequency of intraoperative rupture (IOR) within the total number of treated patients was 14, 7% (79 patients), based on the localisation of the aneurism 11, 9% ACM, 6% of posterior cerebral circulation, ACoA 17%, ACI 17, 3%.

The influence of different factors, which could be predictors of intraoperative rupture was analysed, as well as the influence of intraoperative rupture on the final outcome of the treatment. It is established that IOR is detected more often in a group of patients who are operated on in the early stadium, but also that IOR does not significantly influence the outcome of the treatment in all groups, depending on the timing of the operation.

Keywords: cerebral aneurysms, intraoperative aneurysms rupture, clipping, outcome

224 BRAIN TUMOR SURGERY IN THE 21ST CENTURY WITHOUT ADVANCED TECHNOLOGY

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Brain tumor surgery has undergone numerous changes in the last few decades. Apart from many technological innovations in treatment, the 21st century also brought innovative surgical approaches, as well as a classification based on the molecular features of tumors. The overall progress in the field, conditionally speaking, created a problem for smaller neurosurgical centers to respond to the challenge of modern brain tumor treatment.

In our center we still do not have the opportunity to use neuronavigation, neuromonitornig and operative microscope with the possibility of using fluorescein. In addition, in our center, 6 neurosurgeons perform 80-100 operations on intracranial tumors annually. In the given working conditions, a good treatment outcome is related to a careful preoperative analysis, as well as a good knowledge of anatomy and surgical approaches. The expected postoperative quality of life also participates in the decision-making process whether the patient will be operated on in our facility or will be referred to a higher-ranking institution.

Many brain tumors can be successfully treated surgically even without the achievements of the 21st century. The biggest problem for smaller centers is usually postoperative treatment of patients, which is conditioned by modern classification of tumors and innovative drug and radio therapies. This can be overcome by cooperation with surrounding larger centers.

Keywords: brain tumor, neuro-oncology, advanced technology

225 FUNCTIONAL RECOVERY AFTER SURGICAL TREATMENT OF THE RADIAL NERVE INJURY

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Introduction: The radial nerve is the main extensor of the upper extremity and its injury leads to hand drop and inability to put a hand in a functional position, which produces disability in patients every day and work activities with big socioeconomic problems. Most previous studies showed excellent recovery after surgical treatment of the radial nerve, which can be explained by the fact that the radial nerve is predominantly motor, it innervates synergistic muscles and doesn't innervate intrinsic hand muscles.

Aim: To evaluate functional outcome and quality of life after radial nerve injury surgical treatment. Cases with bad recovery were further analyzed, in order to evaluate the diagnostic and therapeutic protocol and to improve final outcome.

Material and methods: Our study included 140 patients surgically treated due to radial nerve injury during 20 years period. Muscle strength was evaluated using the „British Medical Research Council" scale (MRC scale), while the level of motor recovery was classified using a modified scale of Highet and Holmes. Extension of the wrist, extension of the fingers and thumb, and thumb abduction were evaluated. The quality of life study included 129 patients who agreed to participate in a survey and they were evaluated with the DASH („The Disabilities of the Arm, Shoulder and Hand") and PNSQoL („Peripheral Nerve Surgery Quality of Life") questionnaire.

Results: Out of 140 patients, more than 2/3 were males and the mean population age was 38. The most common mechanism of nerve injury was fracture-related contusion. Disruption of nerve continuity was significantly more common in high-energy traumas. The majority of the patients were treated by neurolysis (68%) and sural nerve grafting (26%), while only a few were treated by direct suture or nerve transfer. Useful motor recovery was achieved in 91.4% of the analyzed patients, as well as in 96% of the cases with neurolysis, 78% of the cases with sural nerve grafting, and all cases with direct suture and nerve transfer. Surgical treatment in the first 6 months since the injury, low-energy trauma, lesions with preserved continuity and lower graft length were associated with better motor recovery. Mean DASH and PNSQoL scores were 18.2 and 66.2, respectively, which indicates good functional recovery and a low rate of postoperative disability. The patients with disrupted nerve continuity more commonly reported difficulties in performing some activities and were less satisfied with the result of the surgery.

Conclusion: Functional recovery after surgical treatment of the radial nerve palsy, as well as the quality of life and patient satisfaction were excellent. High-energy trauma is more commonly related to nerve continuity disruption and requires closer evaluation and earlier surgical treatment. Late patients referral and the need for long grafts were associated with the poorer recovery and the need for nerve and tendon transfer.

Keywords: radial nerve injury, surgical treatment, recovery

226 DEVELOPING A NOVEL, POPULATION-SPECIFIC PROGNOSIS PREDICTION SYSTEM IN THE CASE OF SURGICALLY TREATED SPINE METASTATIC PATIENTS

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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.

Introduction: 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.

Keywords: metastatic epidural spinal tumor, survival, prognosis prediction, scoring system

227 THE LEVEL OF THE CERVICAL PROSTHESIS IN THE HYBRID SURGERY AND ITS EFFECT ON THE CERVICAL RANGE OF MOTION

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Background: There are no clear indications at which level the cervical disc arthroplasty (CDA) should be performed in the Hybrid surgery (HS), involving the combination of ACDF and CDA. Retrospective analysis comparing the clinical and radiographic results in the treatment of the cervical degenerative disease was performed comparing the patients who underwent the HS and had the artificial disc implanted at different levels.

Materials and Methods: After applying the inclusion criteria, 34 patients with two-level cervical degenerative disc disease where conservative treatment failed were included in the study. All the patients had been operated with the hybrid procedure. The CDAs in 18 patients were implanted above and in 16 patients bellow the ACDF level. Clinical outcomes were assessed before and at regular intervals until one year after the procedure using neurological examination, the Neck Disability Index (NDI) and Visual Analogue Scale (VAS) for neck and arm pain, with 15% improvement in NDI and 20% in VAS defined as a clinically significant. The cervical range of motion was evaluated using flexion-extension parameters.

Results: The groups were similar at baseline both clinically and statistically. Both groups had a statistically significant improvement in NDI and VAS for neck and arm pain ($P > .05$) and there was no statistically significant difference between groups at any point of investigation.

There was no statistically significant difference in the C2-C7 ROM between the two groups at 12 and 24 months postoperatively ($P > .05$). The location of the arthroplasty at the level C5/6 or C4/5 provided better ROM compared to the level C6/7.

Conclusions: Both groups resulted in significant pain reduction and functional outcome for the patients in short and long term period. The combination of fusion and arthroplasty can be adjusted to each level allowing segmental motion preservation at the affected levels and minimizing hypermobility at adjacent levels. The ROM was more affected by the level of the artificial disc implantation then relationship of the CDA towards ACDF.

Keywords: Hybrid cervical surgery; cervical disc arthroplasty; cervical ROM

228 SPINAL INJURY. MODERN ASPECT. CYPRUS EXPERIENCE

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Purpose of the study: To develop a conceptual approach and a differentiated methodology for the prevention and treatment of patients with spine and spinal cord injury in Cyprus.

Material and method: From January 2012 to June 30/ 2022, we identified 15210 patients with suspected of spine and spinal cord injury. Of these, 7480 were admitted to public hospitals in Cyprus with a verified diagnose (spine or spinal cord injury) (49.1%) . 6058 male (81%), 1422 female (19%). 966 cases were with spinal cord injury, 8.78 cases/100, 000 population per year. 6514 patients were with spine injury, 59.2 cases/100, 000 / per year, 576 people died, 5.2/100, 000 population p/y. The causes of injury were as follows: road traffic accidents 3328 (44.5%), falls 1658 (22.1%), sports 948 (12.7%), violence 268 (3.6%), others 1278 (17.1%), (Osteoporosis, Pathological fractures). There was uncomplicated spine injury in 6514 p/s, complicated spine injury in 966 p/s. Combined injury was in 2842 p/s. Injury in the cervical region they had 1440 p/s, in the thoracic region 2264, in the lumbar-sacral region 3194. Multiple injuries were in 1496 patients. Of all patients, 2480 (33.2%) received conservative treatment and 5000 (66.8%) surgical.

Results: Injuries of the spine, 60 per 100, 000 / per year. The peak of injury is in young men and older women (young male 16-30, in morning time accident and female over 65, from a fall and osteoporosis). The average length of hospital stay, 38.5 days. Proportionately male to female 4/1. Of those not operated 2204 had a good outcome (mild injury, not complicated). Of those not operated 176 died (combined trauma). Of those operated: 100 pts with tetraplegia, 166 with paraplegia, 300 pts with paresis and 400 pts with mild paresis. All of these with complicated fractures. Of those operated 4734 with a satisfy outcome. Died 576 pts (combined injury, serious condition), 400 pts with complicated and 176 with uncomplicated injury. (5.2 per 100, 000 population).

Conclusions: Strict control in night clubs in Cyprus and every island is the key to reduce the spinal injury. Preventive measures in agricultural work and at the construction site reduce injuries. Low olive trees appeared. An important stage in the complex treatment of spinal injury is the pre-hospital period (training for medical staff, police officers, firefighters, etc. is required). It is necessary to organize a qualified spine units that could receive all spinal injuries in Cyprus.

Conclusion: Spinal injuries require emergency diagnosis and urgent treatment. It is necessary to have a specialized spine unit in every millionth city (for Cyprus, where 1 million people live and 2-3 million tourists annually, it is necessary to have 2 departments. Today there are no absolute contraindications for surgical treatment. The development of minimally invasive and endoscopic methods of treating spinal injuries, has given the ability for surgeons to quickly and without traumatization restore the function of the spine.

Keywords: Spine trauma

229 LOW GRADE LUMBAR SPONDYLOLISTHESIS – IS FUSION AFTER DECOMPRESSION IS NECESSARY?

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Background: In patients with symptomatic single-level degenerative lumbar grade I spondylolisthesis with spinal stenosis, it is unclear if decompression with instrumented lumbar fusion is superior to decompressive laminectomy alone.

Aim: To evaluate the comparative effectiveness between decompression with and without instrumented fusion in patients with grade I spondylolisthesis and spinal stenosis.

Materials and methods: We conducted a systematic literature review and retrospective analysis involving patients with symptomatic lumbar stenosis not responding to conservative treatment and who had and who had grade I single-level spondylolisthesis surgically treated in our institution. Patients were assigned to two treatment groups, receiving decompression alone and other decompression with instrumented lumbar fusion. Patients have been followed up in the outpatient clinic one month and six months after surgery regularly with follow-up MRI. Data retrieved were statistically analysed for potential differences regarding the outcome.

Results: Reviewed literature revealed no overall significant difference between the two operative techniques in functional level or disability, back pain scores, complication rate, and reoperation rate. However, instrumented lumbar fusion was associated with greater blood loss, longer hospital stay and increased operative time. On the other hand, there was a slight difference in the lower leg pain scores and lower satisfaction in patients treated with lumbar decompression alone.

Conclusion: In this review involving patients with symptomatic single-level degenerative lumbar grade I spondylolisthesis with spinal stenosis, decompression with instrumented lumbar fusion was no superior to the decompression alone. Lumbar fusion had a higher satisfaction rate and leg pain scores; however, no difference was observed when considering functional level, disability, complication and reoperation rates, and back pain scores.

Keywords: Degenerative spondylolisthesis; Decompression; Fusion; Systematic Review

230 Recurrent compressive radiculopathy after lumbar surgery disc herniation

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Introduction: Lumbar disc hernias are a common cause of spinal surgery. Hernia recurrence is a prevalent complication, but does not necessarily require reoperation

Objective: To analyse the risk factors associated with hernia recurrence and radiculopathy in patients undergoing surgery in our institution.

Materials and methods: Lumbar microdiscectomies for 5 years period were analysed, patients with previous surgeries, extraforaminal and foraminal hernias were excluded. Patients with recurrent hernia were the case group and those who showed no recurrence were the control group.

Results: microdiscectomy was performed in 152 patients with lumbar disc herniation, of whom 22 patients experienced recurrent radiculopathy (18.42%) according to modified MacNab criteria, and of these 4 were reoperated (2.63%). Among the risk factors associated with recurrence, we observed a higher rate of disc height, higher percentage of spinal canal occupied by the hernia and presence of degenerative facet joint changes; we observed no differences in sex, body mass index or age.

Discussion: Previous studies show increased disc height and young patients as possible factors associated with recurrence.

Conclusion: In our series we found that the higher rate of disc height, the percentage of spinal canal occupied by the hernia and degenerative facet joint changes were associated with hernia recurrence, our study suggests that recurrent radiculopathy, although not a rare complication, does not necessarily require reoperation.

Keywords: Lumbar disk herniation; Microdiscectomy; Recurent compressive radiculopathy

231 PERIOPERATIVE TREATMENT OF PATIENTS WITH TUMORS OF THE SELLAR AND PARASELLAR REGION

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Caring for patients with changes in the sellar and parasellar regions of the central nervous system requires a multidisciplinary approach, that is, evaluation by endocrinologists, neurosurgeons and neuroanesthesiologists. The pathophysiological aspects associated with pituitary tumors require a thorough assessment of respiratory, cardiovascular, neurological and endocrinological functions. Strategies of good anesthesiology practice are reflected in adequate preoperative preparation, selection of the safest medications, anesthetics, opioids and solutions in the intraoperative period. Monitoring the neurological and hemodynamic status of operated patients, adequate endocrinological substitution, as well as the correction of potential acid-base-electrolyte imbalances are a challenge even for the most experienced intensivists, especially if it is a pediatric group of patients.

Keywords: neuroanesthesiology; intensive care; pituitary surgery; neuroendocrinololy, cerebral salt wasting, diabetes insipidus, SIADH, central adrenal insufficiency

232 CAN WE PLAN ANTICOAGULATED PATIENTS FOR NEUROSURGICAL EMERGENCIES?

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It is still a common yet difficult therapeutic challenge to treat neurosurgical patients undertaking long-term oral anticoagulant therapy during the periprocedural phase due to a paucity of high-quality data to inform best practice. Venous thromboembolism (VTE) risk varies significantly among neurosurgical patients based on patient mix, procedure, diagnosis technique, and usage of different thromboprophylaxis techniques.

While the procedure bleed risk dictates how and when postprocedural anticoagulant therapy should be restarted, the patient's thromboembolic risk dictates the need for an aggressive periprocedural strategy, including the use of heparin bridging therapy, to minimize time off anticoagulant therapy. The anticoagulant effects of direct oral anticoagulants (DOACs) and vitamin K antagonists are comparable. The advent of DOACs—rivaroxaban, apixaban, dabigatran, and edoxaban—with their quick onset, short half-lives, and dependable pharmacokinetics and mechanisms of action should facilitate the administration of these medications during periprocedural procedures. Any medical professionals who treat those individuals ought to be aware of the best course of action for reversal, given the type of medication and the patient's clinical state when they underwent neurosurgical intervention. For patients receiving DOACs in the event of emergency surgery or bleeding, an evidence-based strategy is still required.

Keywords: neurosurgery; non-vitamin K antagonists; direct oral anticoagulants. References:

233 TRANSPLANTATION AND NEUROSURGERY

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The history of transplantation medicine in the world and in Serbia speaks of the importance of tissue, organ and cell donation. The modern way of life and the increase in the length of life, together with the chronic diseases of the modern era, result in an increasing need for human organs. The progress of anesthesiology and neurosurgery and their strong connection have contributed easy identification of potential donors. Proving brain death and its understanding have resulted in the development of transplantation medicine. The present and the future is in the development of intensive treatment of neurosurgical patients and the parallel development of cooperation in order to strengthen transplantation as the only solution for the increasing numbers of the most difficult patients.

Keywords: Transplantation;neurosurgery;history

234 PREGNANCY AND NEUROANAESTHESIA

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Pregnancy presents unique challenges in the field of neuroanesthesia, where anesthetic management must consider the well-being of both the mother and the developing fetus. Neurosurgical procedures during pregnancy require a delicate balance between ensuring maternal safety and minimizing potential risks to the unborn child. Cardiovascular alterations and hormonal shifts can affect drug pharmacokinetics and alter responses to anesthetics. Close monitoring of maternal hemodynamics, oxygenation, and fetal well-being is pivotal. Anesthetic agents used during neurosurgery must be carefully selected to avoid potential harm to the fetus. Local anesthetics and regional techniques are preferred whenever feasible, as they minimize the systemic effects of anesthesia. Positioning during neurosurgery is another critical consideration.

Communication and coordination among the neurosurgeon, obstetrician, anesthesiologist, and neonatal specialists are essential for successful outcomes. A multidisciplinary approach that might include obstetric anaesthesia specialists ensures that the optimal anesthetic plan is tailored to the individual needs of both the mother and the fetus. With meticulous planning, vigilant monitoring, and interdisciplinary collaboration, the challenges posed by neuroanesthesia in pregnancy can be effectively managed, leading to successful outcomes for both mother and child. This lecture will also address the issue of anesthetic management of obstetric patients who underwent neurosurgical and spinal surgery.

235 ANEURYSMAL SUBARACHNOID HEMORRHAGE- ANESTHESIOLOGICAL ASPECTS OF TREATMENT

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Aneurysmal subarachnoid hemorrhage (aSAH) is life threatening condition which treatment and prognosis are challenging. Although the neurosurgical or endovascular treatment of bleeding aneurysm are well-known and prevent rebleeding, other complications of aSAH may compromise recovery of the patient leading very often to the fatal outcome. Cerebral vasospasm and delayed cerebral ischaemia are some of them. These complications are targeted by the anesthesiologists with intention to improve survival. Beside induced hypertension and volume resuscitation, nimodipine is a cornerstone of vasospasm therapy. Some medications are discovered for prevention and treatment of cerebral vasospasm as magnesium sulfate, statins, fasudil and milrinone. Refractory vasospasm can be treated by endovascular treatment.

Systemic complications of aSAH are also of utmost interest for anesthesiologists. Neurogenic stunned myocardium as well as neurogenic pulmonary edema are reversible complications which can compromise outcome of aSAH patients. Electrolytes and hormone disbalances can also follow aSAH. Anesthesiologists have great possibility to act in systemic complications treatment and improving outcome.

Keywords: aneurysmal subarachnoid hemorrhage, complications, cerebral vasospasm, neurogenic stunned myocardium

236 PRIORITY AND MANAGEMENT OF NEUROTRAUMA IN THE MILITARY HOSPITAL ICU

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Neurotrauma presents unique challenge in the Intensive Care Unit. We highlight critical aspects of prioritizing and managing neurotrauma cases within this specialized healthcare setting.

In the military environment, neurotrauma often results from combat-related injuries, such as blast trauma, gunshot wounds, or falls during training. When it comes to the injured who come from the civilian population or as members of the family of a military insured, then we have severe head and brain injuries due to polytraumatic events, falling from a height, or other non-specific head injuries. These injuries can lead to serious brain damage and require immediate and specialized care. In the ICU of MMA, a systematic approach to prioritization and management of neurotrauma cases is essential to optimize patient outcomes.

Priority in the management of neurotrauma begins with rapid assessment and stabilization. Early recognition of life-threatening conditions, such as elevated intracranial pressure or hemorrhage, is crucial. Utilizing advanced imaging techniques like computed tomography (CT) and magnetic resonance imaging (MRI), clinicians can accurately diagnose and assess the extent of neurological injury. Once the diagnosis is established, a multidisciplinary team consisting of neurosurgeons and intensive care specialists collaborates to formulate a comprehensive treatment plan. This plan often includes surgical intervention, such as craniotomy or evacuation of the hematoma, to relieve intracranial pressure and mitigate further damage. In ICU of MMA, meticulous monitoring of vital signs, intracranial pressure, and neurological status is paramount.

In onclusion, prioritization and management of neurotrauma in the ICU of MMA requires a highly specialized, multidisciplinary approach. Prompt diagnosis, aggressive intervention, and comprehensive care are critical in ensuring the best possible outcomes for military personnel affected by neurotrauma in the challenging environment.

Keywords: neurotrauma, brain injurie, intracranial pressure, hemorrhagia

237 MODERN SURGICAL APPROACHES IN CERVICAL SPONDYLOGENIC MYELOPATHY

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Introduction: Cervical spondylogenic myelopathy (CSM) is a manifestation of extended cervical spinal stenosis and is characterize by severe neurological disorders. Given the high disability and ineffectiveness of conservative treatment of CSM, it is preferable to perform surgical intervention aimed at decompression of the spinal canal. Currently, two surgical treatment tactics compete – laminoplasty and corporectomy.

Objective: To analyze of early (1st day after surgery) and long-term (12, 60 months after surgery) clinical, radiological and neuroimaging results of surgical treatment of cervical spondylogenic myelopathy.

Material and methods: 226 patients with degenerative cervical spinal stenosis, accompanied by myelopathic syndrome, operated (91 women and 135 men, average age 48.1 years). The severity of pain syndrome (VAS scores), proprioceptive sensitivity (M. Doita scale), self-service ability (Nurick scale) and recovery after surgery (JOA scale) were clinically evaluated. The stability of the cervical spine evaluated radiologically. According to neuroimaging data concluded that the severity of stenosis and myelopathy focus decreased.

Results: Early and long-term clinical, radiological, and neuroimaging results were evaluated. In the long-term period (12, 60 and 120 months after surgery), the cervical pain syndrome was 0-3 points according to VAS, initially 6 8 points. When evaluating the results on the JOA scale, proven that the effectiveness of the treatment of myelopathy directly depends on the history and timing of the surgical intervention. According to the Nurick scale, there is a tendency significantly improve the neurological status in patients with the middle stage of the disease, the neurological status of patients with more pronounced stages remains stable or improves, but this requires a longer time. There was an improvement in deep sensitivity on the M. Doita scale in patients with all stages of the disease.

Conclusion: Both methods of surgical treatment (laminoplasty and corporectomy) lead to good outcomes in the treatment of CSM. The effectiveness of surgical treatment of CSM directly depends on the duration of the anamnesis and the timing of decompression intervention. Recovery is better with mild, moderate and moderate clinical manifestations of CSM and with timely access to the surgeon.

Keywords: spondylogenic myelopathy; laminoplasty; corporectomy

238 ANATOMY AND VARIATIONS OF ARTERY OF ADAMKIEWICZ

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Introduction: The spinal cord get vascular supply from three main arteries. The anterior spinal artery supplies the anterior two-thirds, and the 2 posterolateral spinal arteries supply the posterior third of the spinal cord. The artery of Adamkiewicz (AKA), also known as the arteria radicularis magna, is the principal vessel that feeds the lower thoracic, lumbar, and sacral portions of the spinal cord.

Objective: The aim in this presentation is to review the anatomy of artery of Adamkiewicz and to present different variations and orientations of where the artery arises.

Results: The artery of Adamkiewicz is the primary supply to the lower two-thirds of the spinal cord and enters the spinal canal via an intervertebral foramen. Although it typically enters on the left from T9–L1, the artery can enter on either side from T5–L4. AKA typically arises from the left side of the aorta between T8 and L2 with proximate diameter of 0.6 to 1.8 mm. Variants include that AKA arising from the right side of the aorta or level outside of T8 through L2, differences in the angle of how the artery of Adamkiewicz joins the anterior spinal artery, and the presence of more than one artery of Adamkiewicz. AKA found above Thx 8 is represented by 15% of the population.

Conclusion: Despite the great variation in terminology found in the literature, studies are in agreement with relation to the anatomy of the spinal circulation and the existence of a large network of collateral circulation. The anatomical location of the AKA is of great importance for a number of surgical procedures including neurosurgery. Given the importance, it is necessary to carry out preoperative diagnostics in order to avoid neurological complications.

Keywords: artery of Adamkiewicz, AKA, anterior spinal artery, ASA

239 FOLLOW UP STUDY OF PATIENTS OPERATED BY MINIMALLY INVASIVEEXTRAFORAMINALLUMBAR INTERBODYFUSION

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Objectives: The aim of this work was to evaluate radiological and clinical results in patients operated on by the MIS ELIF (extraforaminal interbody fusion) method, as well as to evaluate the safety of the method itself.

Methods: In this clinical study, 33 patients who underwent minimally invasive ELIF were included. All patients underwent the surgical procedure which included general anesthesia, exposing the Kambin's triangle toward the lateral part of the spine, cage insertion for reinforcement of stabilization and fusion, and percutaneous transpedicular screwing. Clinical outcomes were assessed using the visual analogue scale (VAS). Imaging and clinical findings, as far as related complications were depicted and analyzed.

Results: The mean age of all the 33 operated patients (19 women, 14 men) was 60.03 (SD 11.87) years. Paired-Samples T Test was used to evaluate the influence of ELIF on the results related to the VAS scales related to both the pain in back and pain in the legs of the patients after 3 months of the intervention. In the case of back pain, a statistically significant decrease in the value on the VAS scale was found from the moment the patients were admitted (M=6.55, SD=1.92) to the monitored moment 3 months after the intervention (M=2.61, SD=1.75), t=9.44, p<0.001. The mean reduction in VAS score in these patients was 3.94 (SD 2.40), while the 95% confidence interval extended from 3.09 to 4.79. In the case of leg pain, a statistically significant decrease in the value on the VAS scale was found from the time of admission (M=6.73, SD=1.57) to the monitored time 3 months after the intervention (M=1.52, SD=2.17), t=12.05, p<0.001. The mean reduction in VAS score in these patients was 5.21 (SD 2.48); (95% CI: 4.33-6.09). The eta squared values also showed that the impact

of the intervention was very large. Concerning the postoperative complications, only temporary tingling was reported and that was only in three patients. A dura lesion was also noted in only three operated patients. The condition of the implants after 3 months was without any complications in any of the treated patients.

Conclusion: MIS ELIF has been proven as a safe operative method that provides stable spinal fusion with good clinical results in terms of reduced pain in the spine and legs.

Keywords: ELIF, VAS, Spine

240 INTRADURAL CAUDA EQUINA METASTASES: CASE REPORT

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Background: Intradural cauda equina metastases (ICEM) are rare tumors that reduce functional status. Surgery and radiation are feasible and effective treatments but may have debilitating complications.

Case: A 74-year-old patient was admitted as an emergency due to cauda equina syndrome and inability to walk. MRI of the spine indicated an expansive lesion at the L2 level 3.5cmx1.7cm. The patient was operated on for Adenocarcinoma of the colon two years before being admitted to the hospital. Chemotherapy and X-knife were carried out postoperatively. The patient was operated on as an emergency. L2 laminectomy was performed and the maximum reduction of the tumor change was performed. Postoperatively, there is a gradual neurological recovery. The patient was referred for further treatment by the competent oncologist.

Discussion And Conclusion: ICEMs represent late-stage complications of advanced systemic malignancies, and lead to major functional impairments in affected patients. Current treatments offer short-term favorable clinical and radiological responses but are mostly intended only for palliation. Most ICEMs have a symptomatic but non-specific clinical presentation, often delaying diagnosis and leading to progressive worsening of neurological and functional status. Surgical decompression and tumor resection, coupled with adjuvant locoregional radiotherapy and/or chemotherapy, demonstrate favorable rates of symptom improvement and positive radiological responses. However, rates of local tumor control and survival remain discouraging, with future studies required to evaluate the role of newer molecular and immune treatments.

Keywords: Cauda equina, intradural metastases, spine oncology, spine metastases

241 TRANSFORAMINAL FUSION USING PHYSIOLOGICALLY INTEGRATED TITANIUM CAGES WITH A NOVEL DESIGN IN PATIENTS WITH DEGENERATIVE SPINAL DISORDERS: A PILOT STUDY

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More contemporary options have been presented in the last few years as surgical methods and materials have improved in patients with degenerative spine illnesses. The use of biologically integrated titanium cages of a unique design based on computer 3D modeling for the surgical treatment of patients with degenerative illnesses of the spine's intervertebral discs has been proposed and experimentally tested. The goal of this study is to compare the radiographic and clinical outcomes of lumbar posterior interbody fusion with a 3D porous titanium alloy cage versus a titanium-coated polyetheretherketone (PEEK) cage, including fusion quality, time to fusion, preoperative and postoperative patient assessments, and the presence, severity, and other side effect characteristics.

Methods: According to the preceding technique, patients who were operated on with physiologically integrated titanium cages of a unique design based on 3D computer modeling were included in the study group. This post-surveillance study was conducted as a randomized, prospective, interventional, single-blind, center study to look at the difference in infusion rates and the difference compared to PEEK cages. The patients were evaluated using CT scans, Oswestry questionnaires (every 3, 6, and 12 months), and VAS scales.

Results: Six months following surgery, the symptoms of fusion and the degree of cage deflation in the group utilizing the porous titanium 3D cage were considerably lower than in the group using the PEEK cage (spinal fusion sign, $p = 0.044$; cage subsidence, $p = 0.043$). The control group had one case of cage migration into the spinal canal with screw instability, one case of screw instability without migration but with pseudoarthrosis formation and two surrounding segment syndromes with surgical revisions compared with the 3D porous titanium alloy cage group.

Conclusions: The technique for treating patients with degenerative disorders or lumbar spine instability with aspects of neural compression utilizing biologically integrated titanium cages of a unique design based on computer 3D printing from CT scans has been proven. This allows a new approach of spinal fusion to be used in practice, restoring the local sagittal equilibrium of the spinal motion segment and lowering the risk of pseudarthrosis and revision surgery.

Keywords: degenerative diseases; spine; titanium cages; transforaminal lumbar interbody fusion (TLIF); custom design cages; biologically integrable titanium cages; 3D modeling

242 SEXUAL DYSFUNCTION DISORDERS IN YOUNG AGE MALE PATIENTS AFTER SEVERE SPINE INJURIES

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Introduction: Sexual disfunction disorders are serious post traumatic conditions.

Material and Methods: 10 cases of sexual disfunction disorders in young age male (20 to 30 years old) patients after severe spine injuries are presented and discussed .5 cases (50%) reported physiological difficulties influencing their energy for sex, sex drive, ability to initiate sexual activities and achieve orgasm , 3 cases (30%) reported physical difficulties influencing body positioning, body movement and sensation , 2 cases (20%) reported body image difficulties influencing feelings of attractive and comfort with having a partner view one's body during sexual activity.

Results: We perform appropriate neurosurgical , neurological, pscychiatric and radiological evaluation with ct and mri studies in all 10 patients. Psychological support was performed also in all 10 patients (100%). In 3 cases (30%) we observe amelioration through 24 months period.

Conclusions: Collaboration with other medical disciplines is necessary in order to achieve optimal results in order to ameliorate the quality of life.

Keywords: spine, quality of life, neurosurgery, activities

243 OSTEOID OSTEOMA OF A CERVICAL VERTEBRAL BODY

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Case: We report a very rare case of 5-year-old boy with osteoid osteoma of the cervical vertebral body. The patient presented with a 6-month history of neck pain with radiation into the shoulder and arm on the left side, which was relieved by ibuprofen. Neurological examination and plain radiographs of the cervical spine were normal. CT scan and bone scintigraphy, rather than MRI suggested the pathological diagnosis, which was confirmed on histological examination. The patient underwent excision of the lesion via an anterior approach with complete resolution of the pain postoperatively.

Keywords: Spine, Osteoid oseoma

244 PREVALANCE OF LUMBOSACRAL TRANSITIONAL VERTEBRA (LSTV) IN LUMBAR SPINE SURGERY; A SINGLE-CENTER 5 YEARS EXPERIENCE

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Background: Lumbosacral transitional vertebrae (LSTV) are common congenital spinal anomalies, referring to a total or partial unilateral or bilateral fusion of the transverse process of the lowest lumbar vertebra to the sacrum. Its population prevalence range between 4% and 36% [2]. The neurosurgical significance of this anomaly is in determining the correct spinal level at surgery, instability and early degeneration of the level cephaled to the transional vertebrae and nerve root compression from hypertrophy of the transverse process.

Methods: This is a cross-sectional retrospective study from 2015 to 2020 at the Neurosurgery department of the Clinical Hospital Center Zemun. We analyzed 1574 patients operated on for lumbar disc herniation and lumbar spinal stenosis between 2015 and 2020 at the Department of Neurosurgery at Clinical Center Zemun. We collected patient data from available protocols of operated patients and case histories stored in the hospital archive. In order to diagnose LSTV, we have analyzed the available X-ray, CT and magnetic resonance imaging. We used descriptive statistics methods for statistical analysis.

Results: Out of 1574 patients who underwent lumbar spine surgery, in 1256 patients, based on the available documentation, it was possible to ascertain the presence or absence of LSTV. Among them, 481 or 38, 3% had LSTV. Out of 783 patients operated on for lumbar discus hernia, 265 or 33.8% had LSTV, while in 473 patients operated on for lumbar spinal stenosis, 211 or 44, 6 % had LSTV.

Conclusion: This study indicates that the prevalence of LSTV as an anomaly of the spine is higher compared to its prevalence in the general population. This requires experimental research on its importance for the development of degenerative spinal diseases that require surgery.

Keywords: lumbosacral transitional vertebrae; spinal instability, spine surgery;

245 SLEEP DISORDERS IN MIDDLE AGE MALE PATIENTS AFTER SEVERE CERVICAL SPINE INJURIES.

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Introduction: Sleep disorders are serious post traumatic conditions . The signs and symptoms of sleep may include excessive daytime sleepiness, irregular breathing , increased movement during sleep, irregular sleep , abnormal wake cycle , difficulty falling asleep and also others situations.

Material and Methods: 10 cases of sleep disorders in middle age male (45-55 years old) patients after severe cervical spine injuries are presented and discussed .5 cases of insomnia (50%) , 3 cases of sleep apnia(30%) , 1 case of restless legs syndrome (RLS)(10%), 1 case of narcolepsy(10%).

Results: We perform appropriate neurological, pscychiatric and radiological evaluation with ct and mri studies in all 10 patients. In 4 cases we observe amelioration through 12 months period.

Conclusions: Disordered sleep is a common phenomenon after severe injuries. Sleep disruption contributes to morbidity, development of neurocognitive - neurobehavioral deficits, and prolongs the recovery phase after the initial traumatic situation . Appropriate recognition and correction of these problems may limit the secondary effects of such injuries and improve neuro recovery/ patient outcomes. Collaboration with other medical disciplines is necessary in order to achieve optimal results in order to ameliorate the quality of life.

246 COMPARISSON OF NEUROLOGICAL AND FUNCTIONAL IMPROVMENT AFTER SIMPLE DECOMPRESSION VERSUS SPINAL FUSION WITH INTERNAL FIXATION IN TREATMENT OF TWO SEGMENTS LUMBAR STENOSIS

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Introduction: Lumbar spinal stenosis is a common pathology in adults, which is, in most case manifested by intermittent neurogenic claudication and chronic lower back pain. The prevalence of stenotic changes is higher in L4-5 level, followed by the L3-4 and L5-S1 levels.Surgery is indicated for progressive intolerable symptoms or, more rarely, for the neurologically catastrophic initial presentations. Surgical strategy consists mainly of simple decompression with or without additional instrumentation.The aim of this study was to evaluate the effect of simple lumbar spinal decompression versus spinal fusion with internal fixation in treatment of patients with two segments lumbar spinal stenosis and the functional outcome of these patients.

Methods: A prospective cohort study was conducted in the Clinic for Neurosurgery at University Clinical Center of Serbia in the period between March 2016 and March 2019.In this study we included 52 patients(30 male, 22 female patients). First group included 24 patients underwent simple decompression, and second group included 28 patients who underwent decompression and fusion with internal fixation procedure. Every patient was pre and postoperative evaluated clinically and radiologically. Oswestry Low Back Pain Questionnaire and Visual Analog Scale (VAS) back and leg scale were given to patients prior and on follow-up , 24 months after surgery in order to assess and quantify pre- and postoperative pain level and functionality for low back pain. Statistical analysis compared the following parameters between the two groups: age, gender, BMI, the operation time, duration of hospitalization, and intraoperative blood loss.

Results: Our study showed that a prevalence of operation time, duration of hospitalization and intraoperative blood loss rate was significantly higher in the decompression and fusion with internal fixation group compared to single decompression group. ($P < 0.001$). Patients with higher BMI (≥ 30) had greater blood loss and longer duration of hospitalization.However, there was no statistical difference in postoperative ODI and VAS back and leg scores between two groups after 24 months of follow-up.

Conclusion: There is no significant difference in back and leg pain relief nor in the functionality between patients with two segment lumbar spinal stenosis treated with simple decompression and patients treated with spinal fusion with internal fixation. Longer postoperative period of follow-up is required to further evaluation of functionality and pain scale in these patients. Further studies need to be conducted for the purpose of better patients selection for each of these procedures.

Keywords: Lumbar stenosis; simple decompression; fusion with internal fixation

247 THE ENDPLATE ROLE IN DEGENERATIVE DISC DISEASE RESEARCH: THE ISOLATION OF HUMAN CHONDROCYTES FROM VERTEBRAL ENDPLATE

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Background: As a replacement option for laboratory animals, the in vitro organ culture systems are becoming increasingly essential. To study the possible mechanisms of intervertebral disc (IVD) degeneration, live disc cells are highly appealing. In order to study the degenerative processes of the endplate chondrocytes in vitro, we have established a relatively quick and easy protocol for isolation of human chondrocytes from the vertebral endplates.

Methods: The fragments of human lumbar endplates following lumbar fusion were collected, cut, grinded and partially digested with collagenase I. The sediment was harvested and cells were seeded in suspension, supplemented with special media containing high nutrient level. Morphology was determined with phalloidin staining and the characterization for collagen I, collagen II and aggrecan with immunostaining.

Results: In appropriate laboratory conditions, the isolated cells retained viability and proliferated quickly. The confluent culture was obtained after 14 days. Six to 8 hours after seeding, attachments were observed and proliferation of the isolated cells followed after 12 hours. The cartilaginous endplate chondrocytes were stable with the viability up to 95%.

Conclusions: The reported cell isolation process is simple, economical and quick, allowing to establish a viable long-term cell culture. The availability of chondrocyte cell model will permit the study of cell properties, biochemical aspects, the potential of therapeutic candidates for the treatment of disc degeneration as well as toxicology studies in a well-controlled environment.

Keywords: intervertebral disc; endplate; degenerative disc disease; human chondrocytes

248 CASES OF CERVICAL SPINE CONCUSSIONS DURING SPORTS ACTIVITIES

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Aim of this study is to present cases of cervical spine concussions during sports activity. 10 cases are presented. 9 male and 1 female, range of age 16-66, mean age 36, 5 years. 10 hospitalization and treatment, 1 surgical interventions for spinal trauma, 9 cases with conservative treatment. Good outcome in all 10 cases. Pain Killer pharmacological treatment, Ct, Mri and x ray evaluation in all of the. Cervical spine concussions are situations that needs accurate resolution and treatment.

Keywords: spine, athletics, neuroradiology

249 IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE ALGORITHMS IN BIOMEDICAL SIGNALS PROCESSING AS SUPPORT FOR DECISION-MAKING IN SPINAL DISEASES DIAGNOSIS

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The goal of this abstract is to show how artificial intelligence algorithms can be used in biomedical signals processing as a support for decision-making in the diagnosis of spinal diseases. There were two main focus areas: i. automated approach was proposed in the diagnosis of lumbar disc herniation using MR images in the axial and sagittal planes. The goal was to develop a decision support system that will help doctors both in terms of the accuracy of establishing a diagnosis, as well as in terms of the speed of decision-making. The proposed methodology consisted of several key steps:

a. The first step was to automatically detect and segment the L4/L5 and L5/S1 spinal discs using the U-net convolutional neural network, achieving high accuracy in both planes - axial (Dice was 0.961, Jaccard's similarity coefficient was 0.925) and sagittal (Dice was 0.897, Jaccard similarity coefficient was 0.813).

b. In the second step, after contrast adjustment and cropping region of interest, each cut region with the spinal disc was classified based on the created convolutional neural network into classes (healthy, bulge, central, right or left hernia for the axial plane and healthy, L4/L5, L5/S1 hernia level in the sagittal plane). Classification accuracy was 0.87 on axial and 0.91 on sagittal images, while accuracy was 0.8 when combined axial and sagittal images were used. ii. application of a specially designed hardware platform for measuring force was investigated, in order to capture the "phenomenon" of foot muscle weakness, which originates from the pressure of the nerve in the spinal canal due to herniation. After recording the signal, several different classification algorithms were implemented (logistic regression, decision tree, random forest, naive Bayes, support vector method, K nearest neighbors), along with different normalization methods, for the purpose of diagnosing disc herniation at the L4/L5 or L5/S1, on the left or right side.

The obtained results show that some non-linear classifiers such as decision trees or naive Bayes show better accuracy compared to other classifiers, and some normalization methods show even 10% higher accuracy compared to others.

The main advantage of the applied methodology lies in fast and automatic analysis of large amounts of data, reducing waiting time and serving as a support system for medical personnel in decision-making.

Keywords: artificial intelligence; biomedical signal processing; discus hernia; automated diagnosis

250 INTERVENTIONAL NEURORADIOLOGY IN UNIVERSITY CLINICAL CENTER OF SERBIA / TRIBUTE TO BRANKO PRSTOJEVIC

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Traditionally, surgical clipping was the only available treatment modality for intracranial aneurysms. However, in the last three decades, the endovascular therapy of intracranial aneurysms has shown a tremendous evolution and development. From coiling to flow diversion and flow disruptor devices, endovascular treatment (EVT) modalities have increased in number and received broader indications throughout the years. EVT of other cerebral, spinal, and head and neck pathologies has followed in a developement of liquid embolic materials and new supportive devices. In the University clinical center of Serbia, we have started EVT of intracranial aneurysms in 2006 with the supervision of foreign experts. The first individual embolization of intracranial aneurysm was done in 2007 by Prim. dr Branko Prstojevic, with other endovascular methods developed over the next several years.

Prim. dr Branko Prstojevic had introduced into daily routine EVT of carotid-cavernous fistulas, intracranial aneurysms, arteriovenous malformations, dural arteriovenous fistulas vascular tumors of the head, neck, and spinal vascular malformations and tumors. From 2018, other methods were implemented such as atherosclerosis of cerebral arteries, acute stroke, carotid artery disease, venous approach. The scope of practice of inerventional neuroradiology has become complex, requiring training in specific skill sets and techniques.

The evolution of the neuroendovascular field has resulted in the development of program requirements for residency or fellowship education in interventional neuroradiology. We aim to demontrate development of EVT in our institution over the last fifteen years comprising more than 3000 interventions, with the trubute to Prim. dr Branko Prstojevic as a pioneer in this field of medicine.

Keywords: endovascular treatment, aneurysm, history

251 THE REVOLUTION OF FLOW DIVERTERS IN ANEURYSM TREATMENT

Eduardo Boccardi

Flow Diverters have been and still are a paradigm shift in the treatment of cerebra aneurysms.

Keywords: Flow Diverter; Aneurysm

252 ENDOVASCULAR TREATMENT OF DAVFS - CLINICAL CENTER SARAJEVO EXPERIENCE

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Intracranial DAVFs as pathologic shunts between dural arteries and dural venous sinuses, meningeal veins, or cortical veins account for 10%–15% of intracranial arteriovenous malformations.

The presence of a dural arterial supply and the absence of a parenchymal nidus is what them distinguishes from cerebral or spinal AVMs.

The DAVF venous drainage pattern determines the severity of symptoms and provides the foundation for the two major classification schemes of Borden and Cognard.

Most patients with DAVFs present in the fifth and sixth decades with symptoms related to lesion location and pattern of venous drainage.

Pulsatile tinnitus is a common symptom that results from increased blood flow through the dural venous sinuses, particularly in relation to transverse and sigmoid sinus lesions. Cavernous sinus DAVFs can present with ophthalmoplegia, proptosis, chemosis, retro-orbital pain, or decreased visual acuity.

Severe presentations which are more frequent in high-grade DAVFs include intracranial haemorrhage and non-haemorrhagic neurologic deficits such as seizures, parkinsonism, cerebellar symptoms, apathy, failure to thrive, and cranial nerve abnormalities, including rare cases of trigeminal neuralgia.

Endovascular approaches have become the mainstay of DAVF therapy, but the optimal approach for each case should involve discussions among a multidisciplinary team of interventional neuroradiologists, neurosurgeons, neurologists, and radiation oncologists as a consideration of the advantages and disadvantages of transarterial, transvenous, and combined approaches should be given in each case before proceeding with embolization. Treatment is aimed at complete elimination of the arteriovenous shunt—incomplete treatment allows recruitment of collateral vessels and persistent risk of haemorrhage. During the past 2 decades, embolization by using transarterial, transvenous, or, occasionally, combined approaches has become a first-line treatment for DAVFs.

We hereby present recent different successful treatment techniques of DAVFs in Clinical Center Sarajevo that were treated in transarterial and transvenous fashion with use of coils and non- adhesive embolic agents.

Keywords: DAVFs, endovascular treatment

253 VENOUS SINUS THROMBOSIS – WOMEN'S DISEASE?

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Cerebral venous thrombosis (CVT) is a rare disease. Annual incidence ranges from 1 - 2 per 100 000. CVT is more common in females than males (3:1) with the highest incidence in young women. In women association with pregnancy, puerperium, hormonal contraception or hormone replacement therapy are sex-specific risk factors. CVT accounts approximately 1/3 of pregnancy- associated strokes with an incidence of 9/100.000 pregnancies. Oral contraceptives (OC) are a contributing factor in up to 70 % of cases, additionally it is known that there is a synergistic effect of obesity and OC. Independent risk factors in the puerperium are excessive vomiting, infections, caesarean delivery, increasing maternal age and arterial hypertension. General factors increasing the risk for CVT are genetic thrombophilia (factor V Leiden, prothrombin gene mutation, protein C and S deficiency), anemia, malignancy, systemic diseases, concomitant infections, smoking, trauma or surgery. Clinical symptoms of CVT usually start subacutelly with headache, epileptic seizures, focal symptoms, visual loss or mental status disorders.

Guidelines recommend acute treatment of CVT with low molecular weight heparin (LMWH) or unfractionated heparin (UFH), and switching to warfarin as a standard treatment regime. Standard of care treatments are consensus-based, derived mainly from the observational studies. Direct oral anticoagulants (DOACs) were proven to be as effective but safer compared to warfarin in patients with venous thromboembolism, but they are not first line therapy in CVT yet. Data on DOACs use for CVT in clinical practice is scarce, several prospective multicenter randomized clinical trials (RCTs) are running. It is not suggested to use DOACs in pregnancy, breastfeeding and in antiphospholipid syndrome. The duration of anticoagulation treatment according to American Health Association/American Stroke Association (AHA/ASA) and European Stroke Organization (ESO) guidelines recommend treatment of provoked CVT for 3-6 months, for un- provoked CVT 6-12 months and if severe thrombophilia or re-current venous thromboembolism was found for the indefinite duration of time. Treatment of CVT during pregnancy is still a big challenge for clinicians.

Supportive therapy in CVT constitutes of hydration, headache and seizure management and treatment of increased intracranial pressure, including decompressive craniotomy when malignant mass effect from edema or intracranial hemorrhage (ICH) occur.

Mortality rate of CVT has fallen during the last years due to better diagnostic work up and earlier appropriate treatment. Worse prognosis is described in older age patients, male, when ICH is present at admission and if patient has depressed level of consciousness at the presentation. Due to data women have better prognosis.

Guidelines recommend acute treatment of CVT with low molecular weight heparin (LMWH) or unfractionated heparin (UFH), and switching to warfarin as a standard treatment regime. Standard of care treatments are consensus-based, derived mainly from the observational studies. Direct oral anticoagulants (DOACs) were proven to be as effective but safer compared to warfarin in patients with venous thromboembolism, but they are not first line therapy in CVT yet. Data on DOACs use for CVT in clinical practice is scarce, several prospective multicenter randomized clinical trials (RCTs) are running. It is not suggested to use DOACs in pregnancy, breastfeeding and in antiphospholipid syndrome. The duration of anticoagulation treatment according to American Health Association/American Stroke Association (AHA/ASA) and European Stroke Organization (ESO) guidelines recommend treatment of provoked CVT for 3-6 months, for un- provoked CVT 6-12 months and if severe thrombophilia or re-current venous thromboembolism was found for the indefinite duration of time. Treatment of CVT during pregnancy is still a big challenge for clinicians.

Keywords: CVT, women

254 PREDICTIVE OUTCOME FACTORS (OPEN MICRO SURGERY) IN INTRACRANIAL ANEURYSMS (IA). AN EXPERIENCE OF 1092 CASES

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Introduction: Intracranial aneurysms (IA) have a prevalence of 1-9% in the global population, with higher rates among finnish and asian people and of 2% in patients without any associated risk factors.

Material & Methods: The authors present a retrospective study of 1092 consecutive cases operated by immediate microsurgical approach on a period of 27 years from 1995 to 2022 in Timis County Emergency Hospital – Neurosurgical Department. Inclusion criteria are gender, age, IA location, clinical features and patient’ comorbidities. Treatment approach consisted exclusively of open microsurgical dissection – clipping, with surgical timing of immediate surgery (<24h).

Results: Patients age ranges from 0.9 to 81 years with a mean of 53.1 +/- 12.505 (n = 918); 37.73% women and 62.27% men. Most patients (n=280) are between the age of 50 and 60. IA location shows a preponderance of ACoA (36.45%, n=398), followed by MCA (22.89%, n=250) and ICA (17.4%, n = 190). Mean H&H score admission: 2.44 +/- 1.271 (n=888), More than half of admitted patients had a score of 15 on GCS (445 cases, 50.7%, n=898), the median score being 12.51 +/- 3.796.

Clinical symptoms: hemiparesis (177 patients, 16.2%, n=1092), headache (50 patients, 4.6%, n=1092), neck stiffness (43 patients, 3.9%, n=1092) and oculomotor palsy (40 patients, 3.7%, n=1092). Patient comorbidities: arterial hypertension - 44.1%, 482 cases (n=1092), ischemic cardiopathy - 5.8% (63 cases, n=1092), diabetes - 4.1%, 45 cases (n=1092) and obesity - 3.5%, 38 cases (n=1092).

Conclusions: From our analysis, we present as outcome predictive factors: patient's age ($p < 0.001$, n=918), arterial hypertension ($p < 0.004$, n=871) as well as clinical features – headache ($p < 0.002$, n= 871), hemiparesis ($p < 0.001$, n=871) and scores upon admission – Hunt and Hess ($p < 0.001$, n=814) and GCS ($p < 0.001$, n=823). For ruptured IA, it can be stated that although short term results are promising for endovascular approach, also proving to determine less perioperative complications, mortality and morbidity rate, in the long term those parameters are similar with the neurosurgical approach. However, clips still remain more efficient in terms of occlusion, rate of thrombosis and rebleeding prevention, especially on longer periods of time.

Keywords: Intracranial aneurysms, Microsurgery, Hunt&Hess Scale, Outcome, Predictive Factors

255 SURGICAL MANAGEMENT OF SPONTANEOUS INTRACEREBRAL HAEMORRHAGE: WHY AND WHEN?

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Spontaneous intracerebral hemorrhage remains a significant cause of stroke mortality and disability worldwide. While surgical evacuation has not shown benefit in randomized controlled trials overall, analyses indicate selected patients may benefit from early surgery. Current AHA/ ASA guidelines recommend offering surgery within 24 hours for young, good-grade patients with lobar clots and deterioration from hematoma expansion. Younger patients with superficial lobar clots under 30ml in volume and significant early neurological decline appear to gain the most advantage if hematoma is evacuated early. Less invasive techniques like endoscopic aspiration and thrombolytic therapy show initial promise but require further study. Careful patient selection and future research are paramount to clarify the optimal surgical management of spontaneous intracerebral hemorrhage.

Keywords: Intracerebral hemorrhage; neurosurgical procedures; treatment

256 COMPARATIVE ANALYSIS OF POSTOPERATIVE OUTCOMES AND RESECTION/OCCLUSION GRADE FOR CEREBRAL ARTERIOVENOUS MALFORMATIONS: MICROSURGERY VS. GAMMA KNIFE

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Objective: The objective of this study was to evaluate the effectiveness of microsurgical resection compared to radiosurgery in treating arteriovenous malformations (AVMs) and assess postoperative outcomes.

Methods: A total of 59 patients with cerebral AVMs, presenting at Ibn Sina Hospital in Kuwait between 2013 and 2023, were included in this retrospective cohort study. Data on clinical presentation (intracerebral hemorrhage or seizures), Spetzler-Martin (SM) grade, treatment modalities (radiosurgery or microsurgical resection), short-term and long-term postoperative outcomes, and grade of resection/occlusion were collected.

Results: Among the 59 patients, 72.9% presented with intracerebral hemorrhage, while 22% presented with seizures. The distribution of SM grades was as follows: 15 (25.4%) Grade I cases, 26 (44.1%) Grade II cases, 11 (18.6%) Grade III cases, and 7 (11.9%) Grade IV cases; no Grade V cases were included. Embolization was performed in 14 patients. Microsurgical resection alone was conducted in 24 (40.7%) patients, while 28 (47.4%) underwent radiosurgery alone. Furthermore, 35 patients (59.3%) had AVMs located in eloquent areas. Permanent neurological deficits were observed in 16.1% of surgical patients and 25% of those treated with radiosurgery.

Keywords: AVM; outcomes; grade occlusion/resection; gamma-knife; microsurgery

257 TRAUMATIC DELAYED EPIDURAL HEMATOMA

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Object: Traumatic delayed epidural hematoma (DEH) can be defined as a hematoma that is insignificant or not present on the initial computerized tomography (CT) scan made after trauma but subsequent CT scan shows sizeable epidural bleeding. During a 3-year period we have treated a total of 96 epidural hematomas, eight (8.3 %) of which had a delayed onset.

Case report: We present here an analysis of the eight patients with traumatic DEH which had a significant mass effect in all patients and required surgical evacuation. In three patients with mild head injury (GCS > 12) neurological deterioration indicated the necessity of repeating the CT scan and preceded the detection of DEH. In only one case of the five patients with moderate (8 < GCS < 13) and severe head injury (GCS < 9) was neurological deterioration the precursor of the DEH. All patients were immediately operated on after diagnosis. Postoperative outcome was favorable in all cases.

Conclusions: DEHs are highly unpredictable and continue to cause diagnostic difficulty. Close observation for signs of clinical deterioration and repeat CT scan are the most important factors for early detection of DEH. Early diagnosis and prompt operation offers excellent results for DEHs.

Keywords: Delayed Epidural Hematoma, Trauma

258 DELAYED EPIDURAL HEMATOMA AFTER MILD HEAD INJURY

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Background: Traumatic delayed epidural hematoma (DEH) can be defined as insignificant or not seen on the initial CT scan performed after a trauma but seen on the subsequent CT scan as a “massive” epidural bleeding.

Case report: We presented two cases of traumatic DEH after mild head injury. Both patients were conscious and without neurological deficit on the admission. Initial CT scan did not reveal intracranial hematoma. Repeated CT scan, that was performed after neurological deterioration, revealed epidural hematoma in both cases. The patients were operated with a favorable surgical outcome.

Conclusion: Traumatic DEH could occur in the patients with head injuries who were conscious on the admission with a normal initial CT scan finding. Early detection of DEH and an urgent surgical evacuation were essential for a good outcome.

Keywords: Delayed epidural hematoma, Mild head injury, Trauma

259 STRENGTH AND ELEGANCE: LEADING THE WAY, WOMEN SURGEONS REDEFINING PATHS AND PUSHING LIMITS

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In the ever-evolving landscape of medicine, women surgeons have emerged as powerful forces, reshaping the boundaries and transforming the face of surgical practice. With strength and elegance, they have risen above the challenges and biases, forging new paths and setting remarkable examples for aspiring female surgeons. Through their remarkable achievements, shared experiences, unwavering mentorship, and indomitable spirit, these women surgeons inspire and guide the next generation, bringing forth a profound impact on the field of medicine.

By sharing their experiences, women surgeons provide invaluable insight into the intricacies and complexities of the surgical world. Their stories of triumph over adversity, perseverance in the face of challenges, and professional growth serve as a beacon of hope and motivation for aspiring female surgeons. Through these shared experiences, they impart wisdom and offer guidance, enabling the next generation to navigate the often daunting path toward surgical excellence. Moreover, women surgeons serve as remarkable mentors, providing invaluable support and guidance. By offering mentorship programs and actively engaging in mentor-mentee relationships, they create a nurturing and empowering environment for aspiring surgeons to thrive. Through personalized guidance, career advice, and emotional support, these mentors empower young women to pursue their dreams and overcome barriers. By sharing their own journeys, women surgeons showcase that success knows no gender and that dedication, skill, and resilience are the true determinants of surgical prowess.

Furthermore, women surgeons serve as powerful role models, embodying the notion that gender is not a limitation in the pursuit of surgical excellence. Through their accomplishments and achievements, they shatter the ceiling, challenging the stereotypes and biases that have plagued the medical field for centuries. Their mere presence in surgical suites and leadership positions inspires aspiring female surgeons to dream bigger, aim higher, and break through the barriers that once seemed insurmountable. By witnessing the triumphs of women surgeons, the next generation is encouraged to embrace their own potential, paving the way for a more diverse and inclusive surgical community.

The impact of women surgeons extends far beyond individual mentorship and role modeling. Their collective efforts and groundbreaking achievements contribute to reshaping the surgical landscape as a whole. Through research, mentorship, and leadership positions, women surgeons bring unique perspectives and innovative ideas to the field. They challenge traditional practices, champion gender equity, and promote improved healthcare outcomes. By pushing the limits and redefining the standards of surgical practice, women surgeons foster an environment that encourages growth, collaboration, and the pursuit of excellence.

To summarize, women surgeons play a vital and transformative role in supporting aspiring female surgeons. Their willingness to share experiences, provide mentorship, and serve as role models empower and inspires the next generation. Through their strength and elegance, women surgeons redefine paths, push limits, and shape the future of surgical practice. As the torchbearers of change, they pave the way for a more inclusive, diverse, and innovative surgical community, where talent and determination are the true markers of success.

Keywords: women surgeons ; empower; role models; excellence

260 ARE THE BRAIN INJURY GUIDELINES SUFFICIENT FOR GUIDING TBI MANAGEMENT? A SYSTEMATIC REVIEW AND META- ANALYSIS

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Objectives: The Brain Injury Guidelines (BIG) was developed in 2014 in order to categorise the severity of Traumatic Brain Injury (TBI) and stratify treatment paradigms. The extent to which BIG is effective in predicting the need for neurosurgical intervention and radiological deterioration is unclear. The aim of this study was to analyse and compare clinical studies in order to determine the efficacy of BIG.

Methods: A systematic review and meta-analysis was conducted in accordance with PRISMA guidelines (PROSPEROID CRD42021277542). Three databases were searched, and articles published from 2000 to October 2022 included (last search date 25th November 2022). Meta- Analysis was performed using random effects models.

Results: Of the 1130 articles identified, 13 were included in the analysis (9032 patients- 1433 BIG1, 2136 BIG2 & 3189 BIG3, 2274 not classified. The pooled sensitivity of BIG for predicting neurosurgical intervention was 98.8% (12 studies, 95% Confidence Interval [CI:0.985-1.000]), and 97.3% for radiological deterioration (12 studies, 95% CI: 0.974-0.990-). The specificity in predicting neurosurgical intervention was 9% (8 studies, 95% CI: 0.049-0.085), and 81.5% for predicting radiological deterioration (6 studies, 95% CI: 0.785-0.847 X-X). The Negative predictive value (NPV) for neurosurgery and Radiological deterioration was 99% (6 studies, 95% CI: 0.990-1.000) and 91.8% respectively (6 studies, 95% CI: 0.942-0.975). Two studies (15.4%) were classified as high risk of bias.

Conclusions: The BIG score is highly sensitive at excluding non-neurosurgical significant mild TBI but has low specificity. BIG criteria can be used as an adjunct tool to help clinicians, with BIG-1 cases being very unlikely to require neurosurgical intervention. But BIG-2 and BIG-3 appear to be less useful at ruling in a significant TBI that requires neurosurgical intervention.

Keywords: Traumatic Brain Injury; Brain injury guidelines; Neurosurgical intervention

261 DELAYED EPIDURAL HEMATOMA OF POSTERIOR CRANIAL FOSSA: A CASE REPORT

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The epidural hematoma is most commonly localized in the temporal region due to middle meningeal artery injury with temporal bone fracture. Other sites of epidural hematomas are uncommon. Posterior cranial fossa epidural hematomas are extremely uncommon. Also, majority of epidural hematoma present with acute clinical picture, and delayed epidural hematomas are exceedingly uncommon. Therefore, delayed epidural hematomas located in posterior cranial fossa represent unique finding.

We described a 51-years-old male patient who suffered multiple brain injuries after falling from 5 m height. Patient was treated conservatively with antiedematous therapy, barbiturate sedation, and other supportive therapy. Patient recovered well, however, 15 days after injury brain CT showed posterior cranial fossa epidural hematoma on the right side, below site of occipital bone fracture. There were no signs of brain compression and midline shift. Since patient recovered completely, and since he was without complaints, he was observed for few days, after which he was discharged from the hospital. We performed literature review and found that occipital bone fracture, barbiturate sedation, and antiedematous therapy are risk factors for development of delayed posterior fossa epidural hematoma after traumatic brain injury, which is in accordance with our case.

Keywords: Posterior cranial fossa epidural hematoma; Delayed epidural hematoma

262 EVACUATION PLUS ADJUVANT CISTERNOSTOMY VS EVACUATION ALONE FOR ACUTED SUB DURAL HAEMATOMA IN MODERATE TO SEVERE TRAUMATIC BRAIN INJURY PATIENTS

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Objective: 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.

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)

Inclusion criteria were SDH of more than 10mm thickness with midline shift of at least 5mm and concomitant predominantly unilateral mass effect on a computed tomography scan (predominant SDH component) in moderate to severe head injury patients (presenting GCS <12). In EO group a bone flap with a diameter of at least 12cm was made as routine practice.

In EC group bone flap diameter adjusted according to requirement (mean 8.45cm).

Comparison done for two groups in terms of Hospital stay, 30-day Mortality and GOS-E (Glasgow Outcome Scale Extended) at 1 month, 3 months and 6 months follow up

Both groups were analysed for common post-operative complications such as Hydrocephalus, wound infections, bone flap complications.

Results: Significant difference in hospital stay noted between the two groups. There was no significant difference in 30-day mortality in two groups (5/66 in EC vs 9/74 in EO).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 not replaced in 54/74 (basically a decompressive craniectomy where surgeon expected post-op oedema and brain was not lax at the end of the procedure) and replaced in 20 cases (where brain was lax at the time of closure). In EC group bone flap replaced in 58/66 cases since laxity of brain allowed to do so. In EO group, 33/54 patients underwent cranioplasty by 6 months. Out of 20 patients where bone flap was replaced in EO group, only 1 patient underwent re-operation for bone flap complication at 6 months. Out of 58 cases in EC group where bone flap was replaced, re-operation for bone flap complications carried out only in 3 cases. No bone flap complications noted in 52 cases who were alive at 6 months follow up. A significant difference in post-op hydrocephalus noted at the end of 6 months between two groups. (13/74 in EO group vs 4/66 in EC group at a p value of 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.

Keywords: acute sdh; cisternostomy; GOS-e

263 THREE-MONTH OUTCOME OF PATIENTS OPERATED FOR CHRONIC SUBDURAL HEMATOMA AT FOUR HOSPITALS, ADDIS ABABA, ETHIOPIA, 2021GC

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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.

Method: 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 30th, 2021 G.C.

Result: Out of 144 patients, 56.9% were male, the predominant symptom was a 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%).

Conclusion: Having low admission markwalder grading, being an alcohol abuser, and having post-operative complications will impact the outcome of CSDH patients.

Keywords: CSDH, GOS-E, markwalder grading

264 INCIDENCE, PATTERN, AND OUTCOME OF STRAY BULLET INJURIES: THREE YEARS' EXPERIENCE IN A TEACHING INSTITUTE

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Objectives: The purpose of this study is to better define the incidence, pattern, and outcome of a stray bullet.

Materials & Methods: The current study summarizes the data on stray bullet injuries presented to the Emergency Department (ED) Hayatabad Medical Complex, Peshawar. A total of 24 subjects were included for three years. We enrolled all patients who had head or spine injuries caused by a stray bullet. Data were extracted on demographic profile, site of injury, operative procedure, complication, and mortality, and were recorded on prescribed proforma.

Results: A total of 24 subjects were included for 3 years. 17 (70%) were male patients and 7 (30%) were females. Male to female ratio was 2:1. out of 24 cases, 9 (37.5%) were from District Peshawar, 3 (12.5%) cases were from Mardan and Charsadda District, and 2 (8.3%) cases were from Swat. 12 cases had a bullet in the Head and face. out of which 7 were supratentorial 3 cases had a bullet in the posterior fossa. Out of 24 cases, 13 (54.1%) were operated for the removal of bullets. 5 (20.8%) developed focal or generalized fits. 13 (54.1%) developed a neuro deficit. 4 (16.6%) of cases remain in a vegetative state, and the overall mortality rate is 20%.

Conclusion: Morbidity and mortality due to stray bullets is an increasing problem in our society. This study aims to bring awareness among the concerned authorities to try and bring an end to this menace resulting in deaths and misery.

Keywords: Stray Bullet Injuries, Supratentorial, Posterior Fossa

265 USE OF ANTIEPILEPTIC DRUGS AS PROPHYLAXIS AGAINST POSTTRAUMATIC SEIZURES IN THE PEDIATRIC POPULATION: A SYSTEMATIC REVIEW AND META-ANALYSIS

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We aim to assess the effect of anti-epileptic drug(AED) prophylaxis for early or late posttraumatic seizures, targeting the pediatric population with traumatic brain injury(TBI).

We systematically searched for studies reporting the incidence of posttraumatic seizures in pediatric patients who suffered from TBI and received AEDs prophylactically following their TBI incident. Studies that included adult patients, adult and pediatric patients but did not report results for the pediatric population separately, and patients who did not suffer from a TBI were excluded. Studies that did not indicate the use of antiepileptic drugs prophylactically following TBI were excluded. A total of 10 studies were included involving 4621 posttraumatic brain injury patients of the pediatric age population (<18). Five studies assessed the effect of prophylaxis on early seizures, four on late seizures and one on any seizure. The mean incidence of posttraumatic seizures with AED prophylaxis was 8% for early seizures and 7.1% for late seizures. Moreover, one study revealed no benefit of AED prophylaxis for early posttraumatic seizures. Meta-analysis revealed a significant difference in the incidence of early posttraumatic seizures with antiepileptic prophylaxis. However, no significant difference for late posttraumatic seizures has been shown.

In conclusion, AED prophylaxis seems to be effective against early posttraumatic seizures for the pediatric population, with levetiracetam possibly being more effective. Also, there is no observed benefit for late posttraumatic seizures.

Keywords: Antiepileptic drugs; Pediatric; Posttraumatic brain injury; Prophylaxis.

266 100 CASES OF CISTERNOSTOMY PERFORMED AT A PERIPHERAL TERTIARY CARE CENTRE UNDER LIMITED RESOURCES

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Objective: 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.

Methods: This was a Retrospective analytical study of 100 patients who presented with sTBI (presenting GCS less than 8) to a single Peripheral Tertiary care centre, treated with CS by a single surgeon during a period of 3 years from November 2019 - October 2022

Indications for surgery with CS were Acute SDH, traumatic SAH and contusions, associated with brain oedema which were similar indications for a Decompressive Craniectomy. Following adequate craniotomy and dural opening with evacuation of haematoma and contusions where indicated, Cisternostomy was done in standard fashion. The main steps in the procedure were identification and opening of the sylvian, chiasmatic, optico-carotid and lateral carotid cisterns. Opening of the Liliequist membrane and Lamina Terminalis were done in selected cases. Subarachnoid blood washed out with saline irrigation and a drain was placed in the prepontine cistern routinely which was left for 5 days. The early clinical outcome measures studied were, 30-day mortality and length of hospital stay. The long-term clinical outcome was assessed by using the extended Glasgow outcome scale (GOS-E) at 6 months. Post operative complications were analysed.

Results: Study included 69 males and 31 females with a Mean age of 44.45 years. Study consisted of 53 patients with predominant acute SDH component; 25 patients with predominant SAH component associated with cerebral oedema; and 22 patients with predominant cerebral contusions associated with oedema. Mean operative time was 84.5 minutes. Bone flap was replaced in 84 cases (84%) where it was fixed in 54 cases and left floating in 30 cases. Average hospital stay was 9.68 days and average ICU stay was 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 more than 5 according to GOS-E scale at 6 months, which was considered a favourable outcome. Bone flap was removed in 5 cases due to infection during 6 months follow up. 77/100 cases at 6 months follow up showed good healing without any bone flap complications. 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.

Conclusion: Cisternostomy can be considered as a viable and safe technique in severe traumatic brain injury 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. The technique needs expertise in Neuro-vascular surgery which has a considerable learning curve and the need of an operating microscope.

Keywords: cisternostomy; severe traumatic brain injury; GOS-e

267 THE FREQUENCY OF BILATERAL CHRONIC SUBDURAL HEMATOMAS IN PATIENTS ON ANTICOAGULANT OR ANTIPATELET THERAPY

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Introduction: Chronic subdural hematomas (CSDH) are one of the most frequent clinical haemorrhaging conditions or disorders that account for 16-20% of bilateral CSDH. It represents type of intracranial haemorrhage that if not diagnosed and treated early, has a mortality rate of 10-15%. CSDH occurs most often in the elderly population, a group of patients that due to frequent comorbidities, very often needs anticoagulant and/or antiplatelet therapy.

Objective: We evaluate the frequency of CSDH in patients who were placed on long-term anticoagulant or antiplatelet therapy with an emphasis on patients who presented with bilateral hematomas.

Methods: In a retrospective review of a prospectively maintained, single-center database, we identified all patients with CSDH in a six year period from January 2017 to December 2022. The evaluated group consists of patients aged 40 to 85 years. The Pearson test of correlation was used to analyze the parameters.

Results: We collected data from 121 patients with CSDH, from which 43 patients were with bilateral CSDH. From the 43 patients with bilateral CSDH, 10 or 23, 25% were on long-term anticoagulant therapy with coumarol. The remaining 76, 75% or 33 patients are not subject to any anticoagulant therapy. We didn't encounter patients with bilateral CSDH that took antiplatelet drugs.

Conclusion: According to the results from our study there is no significant correlation between the occurrence of bilateral CSDH and the use of anticoagulant therapy, that is, the null hypothesis is rejected. During our study, there weren't any patients who developed bilateral CSDH and took antiplatelet therapy to examine their association.

Keywords: Chronic subdural hematomas, CSDH, bilateral CSDH, anticoagulant therapy, antipatelet therapy

268 337 COMPARISON OF OUTCOMES, SIGNS, AND SYMPTOMS OF TRAUMATIC POSTERIOR FOSSA EPIDURAL HEMATOMA (PFEDH) PATIENTS WHO MANAGED SURGICALLY VERSUS CONSERVATIVELY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Aim: To compare patients with PFEDH who managed surgically versus conservatively in terms of signs and symptoms at admission and outcomes at follow-up.

Method: This systematic review was performed according to PRISMA guidelines on four databases: PubMed, Scopus, EBSCO, and Cochrane central up to December 20th, 2021.

Result: Eighteen observational studies including 713 patients were assessed quantitatively. The proportion of patients achieved a Glasgow Outcome Scale (GOS) score of 5 was higher in the conservative group (Odds Ratio [OR] = 3.588, $p < 0.001$) and odds of mortality were lower in the same group (OR = 0.210, P = 0.010). Surgical groups were more likely to have vomiting (OR = 3.316, P = 0.049), loss of consciousness (LOC) (OR = 4.584, P = 0.039), and bone fractures (cranial or facial) (OR = 3.223, P = 0.045), but less likely to have headache (OR = 0.342, P =0.032) at the admission time. There was higher proportion of males in the surgical group (proportion in surgical = 71%, $p < 0.001$ versus proportion in conservative = 54%, $p < 0.001$).

Conclusion: The initial presentation and overall outcomes of PFEDH patients who managed conservatively usually are better than those who managed surgically. This doesn't indicate that conservative management is used all time, as the treatment option should be in accordance with Brain Trauma Foundation's Guidelines in 2006, that surgical intervention is still the mainstay treatment and conservative management is used upon neurosurgeon's discretion depending on admission neurological status and other many criteria.

Keywords: PFEDH , Epidural Hematoma , Posterior Fossa

269 THE ROLE OF CISTERNOSTOMY IN THE MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY

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Background: Traumatic brain injury (TBI) is a critical public health problem worldwide, constituting a major cause of mortality and morbidity for people of all ages, but especially in the younger population. Decompressive craniectomy (DC) and cisternostomy are surgical procedures commonly used in the management of severe TBI, but their effectiveness in improving outcomesremains controversial.

Introduction: Cisternostomy, has been routinely used in aneurysm surgeries and skull base tumors, has recently been reintroduced as an adjuvant surgical procedure for reducing brain edema and resistant intracranial hypertension . Cisternostomy is defined as opening the basal cisterns to atmospheric pressure and the drainage of the subarachnoid basal cistern. This technique helps to reduce the ICP in severe head trauma as well as other conditions when so-called sudden "brain swelling" troubles the surgeon . Cisternostomy is a technique that incorporates knowledge of skull base surgery and microvascular surgery, as, by opening the basal cisterns to atmospheric pressure, this technique could decrease the ICP due to a backshift of the cerebrospinal fluid (CSF) from the swollen brain to the cisterns through the Virchow Robin spaces.

Methods: We conducted a prospective longitudinal study on patients who underwent surgical treatment for severe TBI between 2021 and 2022. The extended Glasgow outcome scale (GOS-E) was used to assess clinical outcome at 2 weeks, 3 months, and 6 months after surgery.

Results: The study included 30 patients (21 men and 9 women) who met the inclusion criteria. Among them, 24 patients (80%) underwent DC combined with cisternostomy, while 6 patients (20%)underwent cisternostomy alone. The initial Glasgow Coma Scale (GCS) score at admission ranged from 4 to 8 points, with an average score of 5.9. The overall mortality and overall morbidity was 13.3% and 20%, respectively. The mortality rate was 12.5% and 16.7% in the DC + cisternostomy group and in the cisternostomy alone group, respectively. No statistically significant difference was seen between the two groups in terms of mortality, morbidity and favorable outcome at 2 weeks, 3 months and 6 months.

Conclusions: Our preliminary multi-center study shows a good clinical outcome in patients who underwent DC + cisternostomy or cisternostomy alone in both early and long-term follow-up. Larger multi-center randomized trials are needed to establish the effectiveness of cisternostomy in the management of TBI.

Keywords: traumatic brain injury; decompressive craniectomy; intracranial hypertension; cisternostomy; neurosurgery; surgical outcome

270 USAGE OF GENTAMICIN AND VANCOMYCIN VERSUS NORMAL SALINE LAVAGE INTRAOPERATIVELY TO TREAT INFECTED DEPRESSED SKULL FRACTURES IN TRAUMATIC BRAIN INJURY PATIENTS

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Introduction: Traumatic brain injury (TBI) due to head injury is a common presentation in emergency departments. The purpose of this study is to compare the case group with dual antibiotic preparation containing both gentamicin and vancomycin as intraoperative lavage with a control group in which normal saline wash to study the overall incidence of infection following depressed skull fractures which has been reported to be 10.6% in developed and higher in developing countries and has been associated with a higher incidence of persistent neurologic deficit, late-onset epilepsy, and death.

Methods and materials: A Prospective Case-Control Study was conducted in the Neurosurgery Department, Emergency Complex, Mayo Hospital, Lahore for a duration of 6 months; from 01- 01- 2022. to 30- 06- 2022. Stratified Random Sampling used Total sample size was 62 cases i.e. 31 patients in both case and control groups.

Results: The mean age of participants in our study group was 25.85 + 13.28 years, mean GCS at presentation was 12.74 + 2.579. At presentation, most of the patients had an open wound (77.4%, n=48) with CSF leak (51.6%, n=32) without any foreign body (71%, n=44) or brain matter (61.3%, n=38) visible on inspection with relatable CT findings. In

control group (normal saline wash), the mean duration of hospital stay was 15.81 + 14.284 days whereas in the case group (gentamycin and vancomycin wash), the mean duration of hospital stay was 4.32 + 2.60. The independent sample t- test showed a statistical difference ($p < 0.001$) in hospital stay between the case and control groups.

Conclusion: The study suggested that the use of intraoperative gentamycin and vancomycin wash in the management of depressed skull fractures had significantly better outcomes including a decrease in the duration of hospital stay and better GOS, as well as decreased incidence of postoperative complications including CSF leakage, flap necrosis, osteomyelitis,

SubGaleal abscess, cerebral abscess, meningitis, and need for re-operation in highly burdened trauma settings of developing countries with inadequate surgical sterilization protocols and patient-related parameters.

Keywords: gentamycin, vancomycin, depressed skull fractures, TBI

271 SUBARACHNOID HEMATOMA OF THE CRANIOCERVICAL JUNCTION AFTER TRAUMATIC CEREBRAL CONTUSION TREATED WITH A SPINAL TAP: CASE REPORT

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Background: Spinal subarachnoidal hematomas are rare events, which have been more frequently reported following diagnostic or therapeutic procedures, in patients under anticoagulation or antiaggregation treatment, or occurring spontaneously. A traumatic etiology is extremely rare and there are very few cases published.

Methods: We present a rare case of subarachnoid hematoma of the craniocervical junction, developing nine days after right temporal lobe contusions due to clot migration alongside the adjacent arachnoidal spaces along the right lateral and dorsal aspect of the foramen magnum, involving the cerebellopontine and cerebellomedullary cisterns and cisterna magna all the way to the spinal canal at C1 level, causing severe neurological impairment. A 58 -year-old male was admitted to the Emergency Department of our Hospital after a car accident. At arrival, the patient was comatose, GCS 8. Initial CT scan showed multiple small contusions at the right temporal lobe, traumatic subarachnoidal hemorrhage. The patient was intubated and admitted at the ICU. He was treated conservatively and his neurologic status improved gradually and he was extubated a week after the injury. On the ninth day, he presented with acute severe neurologic impairment, he was intubated and put back on the ventilator. A CT scan was performed that showed a subarachnoidal hematoma at the craniocervical junction. Further evaluations were performed such as a CT and MRI angiography that showed no aneurysms, dissection or AVMs. Five days after the incident, giving that the haematoma showed signs of regression, we decided to perform a therapeutic spinal tap. Control CT scan of the brain after the spinal tap showed no signs of the hematoma. The patient condition gradually improved, he was taken off the ventilator 10 days after the spinal tap, he as able to breathe and feed on his own.

Conclusion: Neurological improvement after treatment was remarkable and the patient regained an autonomous lifestyle. To our knowledge, there are a very few cases reported of such an unusual evolution of a brain contusion, all of them treated surgically. Ours is the only case where spinal tap was initial and final treatment, with remarkable results.

Case report: We present a rare case of subarachnoid hematoma of the craniocervical junction, developing nine days after right temporal lobe contusions due to clot migration alongside the adjacent arachnoidal spaces along the right lateral and dorsal aspect of the foramen magnum, involving the cerebellopontine and cerebellomedullary cisterns and cisterna magna all the way to the spinal canal at C1 level, causing severe neurological impairment. A 58 -year-old male was admitted to the Emergency Department of our Hospital after a car accident. At arrival, the patient was comatose, GCS 8. Initial CT scan showed multiple small contusions at the right temporal lobe, traumatic subarachnoidal hemorrhage, countisons of the lungs and a fracture of the left olecranon. The patient was intubated and admitted at the ICU. He was treated conservatively and his neurologic status improved gradually and he was extubated a week after the injury.

On the ninth day, he presented with acute severe neurologic impairment, he was intubated and put back on the ventilator. A CT scan was performed that showed a subarachnoidal hematoma at the craniocervical junction, the contusions of the temporal lobe were not present. Our working theory is that the clot migrated through the adjacent subarachnoid spaces to the craniocervical junction. Laboratory examinations were in range, the patient was receiving LMWH 40 I.U. Further evaluations were performed such as a CT and MRI angiography that showed no aneurysms, dissection or AVMs.

Keywords: Neurotrauma, cerebral contusions, subarahnoid hematoma, spinal neurosurgery

272 EVALUATION OF CRASH-TBI SCORE FOR PREDICTING OUTCOMES OF DECOMPRESSIVE HEMI-CRANIECTOMY VERSUS STANDARD CONSERVATIVE TREATMENT IN PATIENTS WITH TRAUMATIC BRAIN INJURY

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Introduction: Traumatic Brain Injury (TBI) can be defined as a disruption in normal brain functioning resulting from the sudden, unexpected, and intolerable application of mechanical force. The DECRA (Decompressive Craniectomy in Diffuse Traumatic Brain Injury) Trial, reported the use of early Decompressive Craniectomy in the management of severe diffuse TBI and refractory intracranial hypertension. The study was conducted to use the CRASH-TBI score to predict the 14-day mortality and 6-month overall outcomes of the patients who underwent Decompressive Hemi-Craniectomy as well as standard treatment in our setup and to compare these predicted outcomes with the outcomes observed in our study.

Materials And Methods: A Retrospective Case-Control Study was conducted in the Neurosurgery Department, Emergency Complex, Mayo Hospital, Lahore for a duration of 6 months; from 01- 06-2022 to 31-12-2022 with Stratified Random Sampling.

Results: The mean age of participants of the study was 40.61 ± 11.80 years. The case group which presented with the mean GCS of 7.45 ± 2.38, underwent Decompressive Hemi- Craniectomy comprised of 31 patients. The majority in case group had no major extra-cranial injury, obliteration of the third ventricle or basal cisterns (64.5%, n = 20), and an absence of subarachnoid hemorrhage (58.1%, n = 18), or non-evacuated hematoma (74.2%, n = 23) whereas petechial hemorrhages, midline shift, were present in all the cases (100%, n = 31).

The control group which received treatment according to standard protocol comprised of 31 patients with mean GCS of 10.74 ± 0.99 and absence of major extra-cranial injury (87.1%, n = 27) whereas petechial hemorrhages, as well as midline shift, were present in all the cases (100%, n = 31). Furthermore, there was an absence of obliteration of the third ventricle or basal cisterns (71%, n = 22), an absence of subarachnoid hemorrhage (61.3%, n = 19), and an absence of non- evacuated hematoma (67.7%, n = 21) in majority of the patients.

In the case group, the mean eGOS at 14 days or discharge was 3.06 ± 2.25 whereas the mean eGOS at 6 months was 2.61 ± 2.27. Regression analysis was conducted using the predicted outcomes of CRASH-TBI score as an independent variable, and a dependency was correlated with the actual eGOS observed in our study. control group, the mean eGOS at 14 days or discharge was 2.55 ± 1.91 whereas the mean eGOS at 6 months was 2.19 ± 1.98.

The results showed that the estimated risk of 14-day Mortality by CRASH-TBI score significantly predicted the eGOS observed in our study at 14-days or discharge, $F(1, 29) = 35.249$, $p < 0.001$.

Conclusion: The CRASH-TBI score can be used to predict outcomes better in patients who underwent Decompressive Hemi-Craniectomy due to traumatic brain injury as compared to those who underwent conservative standard treatment. Furthermore, Decompressive Hemi- Craniectomy is associated with better short-term (low rate of 14-day mortality) and long-term outcomes (low rate of the unfavorable outcome at 6 months) as compared to conservative standard treatment. Further studies should be conducted to establish guidelines for the use of Decompressive Hemi-Craniectomy and new variables should be added to CRASH-TBI score to improve its ability to predict outcomes in patients who underwent surgical intervention.

Keywords: CRASH-TBI Score, Decompressive, Hemi-Craniectomy

273 SPONTANEOUS CHRONIC SUBDURAL HAEMATOMA IN HIV-SEROPOSITIVE PATIENTS

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Background: Chronic subdural haematoma (CSDH) is a common neurological disease that predominantly affects the elderly with a rising incidence. Its pathogenesis involves a complex interplay between inflammation, disorganised coagulation, fibrinolysis and angiogenesis. Human Immunodeficiency Virus (HIV) infection is a link between inflammation, immune activation, and endothelial dysfunction through its Tat, gp120, and Nef proteins and there is an increased incidence of vascular disease due to dysregulated angiogenesis in HIV-infected patients. The purpose of this study was to describe the characteristics of HIV-seropositive patients treated for CSDH at a referral hospital in the province of KwaZulu Natal (KZN).

Methods: This retrospective chart review included all HIV-seropositive patients treated for CSDH at IALCH between January 2006 and December 2022. Data collected and analysed included demographics, clinical presentation, radiological features, haematological and biochemical results and outcome measures including Glasgow Outcome Scale (GOS), surgical complications and death.

Results: Fifty-four (54) patients were enrolled in this study, 28 were female (51.9%) ($p = 0.1736$). The mean age was 39.4 years ± 14.1 (5-76) ($p < 0.001$). Seven (12.9%) patients had thrombocytopaenia (<150) and 3 (5.6%) were on anticoagulants. The median CD4 count was 210 (IQR 306). Headache was the most common presenting complaint (26, 48.1%). Cerebral atrophy was found in 4 patients (7.4%).

CSDH recurred in 8 patients (14.8%) and 3 (5.6%) patients had infected residual CSDH. There was no correlation between CSDH recurrence and CD4 ($p = 0.6676$) or HIV viral load (HIVVL) ($p = 0.9120$). The presence of previous opportunistic infections was a predictor for recurrence ($p = 0.0107$). There were no reports of surgical site sepsis. Systemic sepsis occurred in 3 (5.6%) patients and infected residual CSDH occurred in 3/54 (5.6%). Seven (12.9%) patients died.

Re-drainage of residual CSDH ($p < 0.001$) and not being on ART ($p = 0.0318$) correlated with an increased risk of infected residual CSDH. There was no correlation between HIVVL ($p = 0.6393$) and CD4 count ($p=0.2453$) and death, however death correlated with urea > 6.3 mmol/L ($p = 0.0473$), creatinine > 90mmol/L ($p = 0.0036$), and treatment with anti-coagulants ($p = 0.0047$). Low admission GCS ($p = 0.005$), systemic sepsis ($p < 0.001$), diabetes ($p = 0.009$) were also strong predictors of death.

Conclusion: This study showed that PLWHIV present with spontaneous CSDH at a younger age than expected. ART improved outcomes but complications did not correlate with CD4, viral load or age.

Keywords: HIV, Chronic Subdural Haematoma, Retrospective, Epidemiology

274 RISK OF MENINGITIS AFTER POSTERIOR FOSSA DECOMPRESSION WITH DURAPLASTY USING DIFFERENT GRAFT TYPES IN PATIENTS WITH CHIARI MALFORMATION TYPE I AND SYRINGOMYELIA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Several complications have been reported after the use of grafts for duraplasty following posterior fossa decompression for the treatment of Chiari malformation type I. This study aims to investigate the rate of meningitis after posterior fossa decompression using different types of grafts in patients with Chiari malformation type I and associated syringomyelia.

The search was conducted using multiple databases, including PubMed, Scopus, Web of Science, and Embase. Data on the rate of meningitis, syrinx change, and rate of reoperation were extracted and investigated. Quality of evidence was assessed using the Newcastle-Ottawa scale. Nineteen studies were included in the final meta-analysis, encompassing 1404 patients and investigating autografts, synthetic grafts, allografts, and xenografts (bovine collagen, bovine pericardium, and pig pericardium). Autografts were associated with the lowest rate of meningitis (1%) compared to allografts, synthetic grafts, and xenografts (2%, 5%, and 8% respectively). Autografts were also associated with the lowest rate of reoperation followed by xenografts, allografts, and synthetic grafts (4%, 5%, 9%, and 10% respectively). On the other hand, allografts were associated with the highest rate of syrinx improvement (83%) in comparison to autografts and synthetic grafts (77%, and 79% respectively). Autografts were associated with the lowest meningitis, reoperation, and syrinx improvement rates. Furthermore, synthetic grafts were associated with the highest reoperation and xenografts with the highest rate of meningitis, whereas allografts were associated with the best syrinx improvement rate and second-best meningitis rate.

Future studies comparing autografts and allografts are warranted to determine which carries the best clinical outcome.

Keywords: Chiari malformation; Duraplasty; Meningitis; Posterior fossa decompression; Syringomyelia.

275 BRAIN INFARCTIONS AFTER CRANIAL MENINGEOMA SURGERY: A CASE REPORT

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Introduction: Meningiomas are the slow-growing, most common primary brain tumors, with an incidence of 7.7/100, 000. Due to the close contact with blood vessels, one of the complications of their resection are postoperative infarctions. Our aim in this case was to present multiple brain infarctions as a complication of total meningioma resection, discuss risk factors and increasing awareness among neurosurgeons about protecting of blood vessels during operations.

Case presentation: We present case of a 58-year-old male patient, who was diagnosed with an invasive extraaxial brain tumor of the right frontotemporal region with bone propagation and extracranial extension. After an adequate diagnostic assessment, the patient underwent an surgery, during which the tumor was successfully resected, with the Simpson grade 3.

The postoperative course was withoud any neurological deterioration. On postoperativ day 3, we performed a control head CT scan, which showed multiple cortical and subcortical cerebral infarcts. Regardless, the patient made a good recovery at discharge, with normal neurological findings. Pathological examination revealed Meningeoma meningotheliale CNS WHO gradus I. Follow-up examinations were performed after 3 and 6 months, while the patient reached full recovery.

Conclusion: It is important to keep in mind that protecting of blood vessels is the most important concern during tumor resection and the key to a successful operation. Preoperative assessment of the potential benefits of complete tumor resection versus the risk of surgically induced permanent deficits is very important, and always reduce the rate complications of surgery. Also, we have to think and about alternative treatment modalities.

Keywords: Cranial meningeomas, postoperative brain infarctations

276 “UBI PUS, IBI EVACUA”. TRANSNASAL ENDOSCOPIC DRAINAGE OF BILATERAL FRONTAL BRAIN ABSCESS THAT ORIGINATED AS A COMPLICATION OF SARS-COV-2 PNEUMONIA THERAPY

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Brain abscess represent a life-threatening disease. Abscesses associated with sinus infection are predominantly located in the frontal brain region. The management of brain abscesses is a combination of medical and surgical therapy, and a surgical abscess drainage is necessary in majority of cases.

We present a 45-year-old male patient who was treated by endocrinologist in our hospital because of comatose state due to extremely high blood-sugar-level over 40 mmol/L, which was a complication of corticosteroid therapy used in management of SARS-CoV-2 pneumonia infection. After remediation of these complications, patient was neurologically intact, however, since he had severe headaches brain MRI was performed and showed bilateral frontal brain lesion in communication with frontal sinus and ethmoidal cells. Although brain tumor could not be ruled out, brain abscess was highly suspected. Transnasal-endoscopic drainage of sinus frontalis was performed along with biopsy and drainage of the brain lesion. After confirmation of Klebsiella pneumoniae infection, antibiotic therapy was started, according to the antibiogram analysis. Since patient was in good clinical condition, without severe complaints, and since infection parameters were in normal range, we decided to treat patient with only conservative therapy. After 2 months of therapy patient was discharged from hospital in good condition. Control brain MRI 6 months after hospital discharge showed complete resolution of brain abscesses.

Keywords: Brain abscess; Transnasal operation; Endoscopic operation;

277 INTRAOPERATIVE COMPLICATIONS IN CEREBRAL ENDOVASCULAR ANEURYSMAL SURGERY: A RETROSPECTIVE SINGLE-CENTER STUDY (2019-2023)

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Introduction: Endovascular cerebral aneurysm surgery or endovascular neurosurgery, is a minimally invasive approach, focusing on diagnosis and treatment of intracerebral aneurysms involving catheters, wires, and various other instruments. It has proven to be a promising alternative to open surgical aneruysmal treatment in cerebral aneurysms, but is not without its own set of risks. While offering many advantages, one of which is reduced morbidity and mortality, they are not without fault and on occasion carry life-threatening consequences. This paper aims to examine intraoperative complications in patients treated endovascularly in aneurysmal therapy.

Materials and Methods: To carry out this investigation, we conducted a retrospective analysis of records spanning a five-year period, encompassing the years 2019 through 2023. These records were procured from the Neurosurgical Clinic of Belgrade, University Clinical Center of Serbia. The study cohort consisted of 44 patients who had experienced intraoperative complications. We collected essential information, including patients' age, gender, aneurysm size, location, and specific segment, as well as the precise nature of the intraoperative complications. Subsequently, the gathered data underwent a thorough statistical analysis, utilizing SPSS version 29.

Results: Out of a total of 429 patients who underwent endovascular aneursymal treatment, 44 of them encountered intraoperative complications. The average age of these individuals was 55.4 years, ranging from 13 to 83 years, and a majority of the patients, 37 out of 44 (84.1%), were women. Thirteen patients (29.5%) presented with significant preoperative co-morbidities and had experienced subarachnoid hemorrhaging prior to treatment. The most prevalent location for aneurysms was the internal carotid artery (ACI), accounting for 40.9% of cases, with the C6 segment being the most frequently affected at 27.3%. Other notable locations are ACM (34, 1%) and ACoA (13, 6%).

Concerning intraoperative complications, technical issues were the most frequent, affecting 84.1% of patients, while biological mishaps impacted 7 out of 44 patients (15.9%). Coil failure occurred in 16 out of 44 patients (36.4%), and stent failure was observed in 14 out of 44 patients (31.8%). Catheter-related problems were noted in 5 patients (11.4%), as were thromboembolic events, also in 5 patients (11.4%). Contrast extravasation was observed in 3 patients (6.8%), and hematoma formation occurred in 1 patient (2.3%). Additionally, 12 out of 44 aneurysms were found to be ruptured (27.3%).

In this retrospective study spanning five years, we investigated intraoperative complications in 44 out of 429 patients who underwent endovascular aneurysmal surgery. Our results indicated that the primary source of these complications was related to technical issues, aligning with findings from other referenced studies. Coil and stent failures were notable concerns, alongside catheter-related problems and thromboembolic events.

Conclusion: In conclusion, the endovascular approach to aneurysms, while offering a minimally invasive approach is not without its inherent risks and complications. Despite these challenges, endovascular neurosurgery remains a crucial alternative in the treatment of intracerebral aneurysms.

Keywords:Aneurysm, endovascular, complications, bleeding, coiling, catheter

GENDER

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MALE	7	15.9	15.9	15.9
	FEMALE	37	84.1	84.1	100.0
	Total	44	100.0	100.0	

Statistics

AGE

N	Valid	44
	Missing	0
Mean		55.4091
Median		57.0000
Std. Deviation		11.75391
Range		70.00
Minimum		13.00
Maximum		83.00

WARD

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	A	10	22.7	22.7	22.7
	B	11	25.0	25.0	47.7
	C	4	9.1	9.1	56.8
	D	12	27.3	27.3	84.1
	S	7	15.9	15.9	100.0
	Total	44	100.0	100.0	

PREO_CO_MORBIDITIES

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	31	70.5	70.5	70.5
	YES	13	29.5	29.5	100.0
	Total	44	100.0	100.0	

SAH

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	31	70.5	70.5	70.5
	YES	13	29.5	29.5	100.0
	Total	44	100.0	100.0	

SIDE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO_SIDE	7	15.9	15.9	15.9
	RIGHT	17	38.6	38.6	54.5
	LEFT	20	45.5	45.5	100.0
	Total	44	100.0	100.0	

A_basilaris

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	43	97.7	97.7	97.7
	YES	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

ACA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	43	97.7	97.7	97.7
	YES	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

ACI

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	26	59.1	59.1	59.1
	YES	18	40.9	40.9	100.0
	Total	44	100.0	100.0	

ACM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	29	65.9	65.9	65.9
	YES	15	34.1	34.1	100.0
	Total	44	100.0	100.0	

ACoA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	38	86.4	86.4	86.4
	YES	6	13.6	13.6	100.0
	Total	44	100.0	100.0	

ACoP

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	43	97.7	97.7	97.7
	YES	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

AICA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	43	97.7	97.7	97.7
	YES	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

PICA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	43	97.7	97.7	97.7
	YES	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

SEGMENT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	10	22.7	22.7	22.7
	A1	1	2.3	2.3	25.0
	C5	3	6.8	6.8	31.8
	C6	12	27.3	27.3	59.1
	C7	3	6.8	6.8	65.9
	M1	11	25.0	25.0	90.9
	M2	4	9.1	9.1	100.0
	Total	44	100.0	100.0	

ENTRANCE_ARTERY

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	RIGHT	41	93.2	93.2	93.2
	LEFT	2	4.5	4.5	97.7
	BOTH SIDES	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

BLEEDING

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	32	72.7	72.7	72.7
	YES	12	27.3	27.3	100.0
	Total	44	100.0	100.0	

PROCEDURE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	COILING	28	63.6	63.6	63
	STENT	16	36.4	36.4	100
	Total	44	100.0	100.0	

TYPE_OF_ERROR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BIOLOGICAL_ERROR	7	15.9	15.9	15.9
	TECHNICAL_ERROR	37	84.1	84.1	100.0
	Total	44	100.0	100.0	

COMPLICATIONS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CATHETER_FAILURE	5	11.4	11.4	11.4
	COIL_FAILURE	16	36.4	36.4	47.7
	EXTRAVISATION	3	6.8	6.8	54.5
	STENT_FAILURE	14	31.8	31.8	86.4
	THROMBOSIS	5	11.4	11.4	97.7
	HEMATOMA	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

278 EPIDEMIOLOGICAL CHARACTERISTICS OF PERIPHERAL NERVE SHEATH TUMORS AND THE ASSOCIATION WITH NEUROFIBROMATOSIS

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Peripheral nerve tumors, although relatively rare, encompass a heterogeneous group of neoplasms arising from the nerve sheath or nerve fibers. These tumors can be classified into benign and malignant types, with neurofibromatosis emerging as a significant association. Neurofibromatosis, a genetic disorder characterized by the development of multiple benign tumors along peripheral nerves, particularly Type 1 (NF1), significantly elevates the risk of peripheral nerve tumors. Individuals with NF1 have a predisposition to developing neurofibromas, which can manifest as cutaneous, subcutaneous, or plexiform tumors. These tumors often arise from the nerve sheath and can lead to various clinical manifestations, such as pain, neurological deficits, or disfigurement.

The epidemiology of peripheral nerve tumors, especially those associated with neurofibromatosis, reveals intriguing insights. While the exact prevalence of peripheral nerve tumors in the general population remains relatively low, the occurrence is substantially higher in individuals with neurofibromatosis. In NF1, the incidence of peripheral nerve tumors is estimated to be as high as 20% to 50%. Moreover, the tumors' presentation can be highly variable, ranging from asymptomatic growths to those causing severe pain and functional impairment. Understanding the epidemiology of peripheral nerve tumors is crucial for early diagnosis and management, particularly in individuals with neurofibromatosis. Regular surveillance and clinical assessments are essential for identifying and monitoring these tumors, as they can have a considerable impact on the patient's quality of life.

The aim of this study was to present a single-center expirience with epidemiological characteristics of surgically treated peripheral nerve sheath tumors during a 10-year period and analyze their association with NF.

Keywords: Peripheral Nerves, Tumors, Epidemiology, Neurofibromatosis

279 PERIPHERAL NERVE REGENERATION - HOW FAR HAVE WE GOTTEN?

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Assured success in bridging the nerve defect remains one of the biggest challenges in medical science and practice. The rapidly growing knowledge in this field requires timely and comprehensive literature reviews. This paper reviews current clinical and experimental advances in the field of peripheral nerve regeneration, mostly in the context of direct nerve repair.

The main challenges in the field of peripheral nerve regeneration come with more severe cases of nerve injury, where physiological repair mechanisms, alongside a proper suturing technique, remain insufficient. This results in a misdirection of nerve fibers coming from the proximal segment, leading to a "target reinnervation error", a form of "misinnervation" in which the newly regenerated axonal fibers reach the wrong target, leaving the resulting regenerated nerve with little or no functional capability.

The gold standard for solving this issue today remains an autologous nerve graft. The potential issues with the consistency of this method include donor site morbidity, graft ischemia, sensory loss, inflammation, and neuroma development, leaving researchers and clinicians searching for a more reliable solution.

Most likely, the solution to the "misinnervation issue" of large peripheral nerve defects lies in achieving ideal conditions with proper directing of nerve fibers. The approaches currently being tried are further mentioned, though it is important to note that their optimal combination could be the one with the greatest effect.

Pharmacological solutions may come as either systemically or locally administered neuroprotective or neuroregenerative substances, often combined with scaffolds, gels or conduits. A wide array of compounds belong to this category, with new ones, such as the embryonal PTBP1, emerging constantly.

Nerve conduits and scaffolds can guide nerve fibers during the regenerative process, serving as templates that help bridge the gap between the severed nerve ends and provide a path for axonal growth. This method has not been able to consistently compete with the golden standard so far. Ways to overcome this are being presented in the form of incorporating different biomaterials, including decellularized xenografts, nerve guidance microchannels, gradient cues along the conduit, together with using various growth factors and pharmacological agents.

Stem cell, namely adipose-derived, bone marrow, human umbilical cord, embryonic stem cell, as well as Schwann cell-based approaches have been shown to improve nerve regeneration.

Another promising development in this field comes in the form of guiding regeneration gels, based on tissue engineering technology made to resemble a physiological extracellular matrix, with results comparable to the "gold standard" treatment.

Other approaches, beneficial mostly as complementary treatments to surgical repair, include physical therapy and rehabilitation, as well as specialized electric currents and magnetic fields, with a notable possible prospect in regulatable gene therapy. Optimal suturing technique must not go unmentioned, where the use of microsuturing techniques ensures accurate alignment of nerve endings and minimizes tension at the repair site.

Considering the array of existing methods and the ongoing development of new ones, it becomes evident that further research in this field is imperative.

Keywords: nerve regeneration, nerve injury, peripheral nerve, axon regeneration, peripheral nervous system

280 A CASE SERIES OF 109 SURGICALLY TREATED INTRACRANIAL MENINGIOMAS: A RETROSPECTIVE STUDY WITH LITERATURE REVIEW

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Introduction: Meningiomas are the predominant form of primary intracranial tumors. These tumors are mostly non-cancerous, arising from specific cells in the arachnoid membrane. They make up approximately 13-26% of all brain tumors and tend to occur more frequently in older individuals and in females, while being notably infrequent in children.

Understanding the epidemiological characteristics of patients with intracranial meningiomas provides crucial insights into the prevalence, age distribution, and risk factors associated with this condition, which may aid in tailoring screening and prevention strategies, ultimately improving early detection and patient outcomes. Intraoperative findings play a pivotal role in surgical planning and execution, influencing factors such as tumor resection extent, preservation of critical neural structures, and post-operative complications. Analyzing these findings helps refine surgical techniques, enhancing patient safety and long-term prognosis. Finally, linking epidemiological data with intraoperative outcomes facilitates a comprehensive understanding of the disease's impact on various demographics, guiding personalized treatment approaches and optimizing healthcare resource allocation.

Aim: The purpose of this study is to analyze the epidemiological characteristics, intraoperative findings, and outcomes of 109 consecutive surgically treated individuals with intracranial meningioma and review the literature on the subject.

Materials and Methods: This retrospective study included 109 consecutive patients surgically treated due to intracranial meningioma during a three-year period (2020-2022) at the Department of Peripheral Nerve Surgery, Functional Neurosurgery, and Pain Management Surgery at the Clinic for Neurosurgery, University Clinical Centre of Serbia, Belgrade. The medical records were reviewed for age, gender, frequency, intraoperative findings, and outcomes. Descriptive analysis was performed using SPSS v29.

Results: The frequency of the patients who underwent intracranial meningioma surgery at the department was 9.14%. Among the 109 cases, a greater number of surgeries were conducted on female patients, constituting 65 (59.6%), as opposed to male patients, who comprised 44 cases (40.4%). Patient ages ranged from 21 to 81, with a mean of 58.8±11.9. The frontal lobe was the most commonly affected, accounting for 27 cases (26.2%). There were no lethal outcomes, and complications were noted in only few cases. These results are in accordance with a previously published literature.

Based on a literature review, female predominance in surgeries highlights gender-related aspect, especially in the frontal region. The frontal lobes' functions and surface area may increase vulnerability to meningiomas. Hormones like estrogen, progesterone, and testosterone could be influential.

Conclusion: In conclusion, our study underscores the importance of further research to determine the precise etiopathogenesis related to the observed female predominance and its association with frontal region involvement in intracranial meningiomas.

The absence of lethal outcomes and low complication rates underscore the efficacy and safety of surgical interventions in this patient population, emphasizing the importance of timely detection and intervention for improved overall outcomes.

Keywords: Meningioma Surgery; Intracranial Meningioma; Neurosurgery

281 PRELIMINARY EXPERIENCE OF MINI INVASIVE LUMBAR ARTHRODESIS WITH FACET WEDGES SYSTEM

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The increase number of aging patients suffering from spine degenerative pathology provoke a controversial debate on possibility of vertebral stabilization versus “wait and see” attitude. In favor of this decision are the problems related to osteoporosis, screws late mobilization, upper level new pathology and need of blood transfusion. Because of that we proposed the mini invasive approach with Facet Wedges system in elderly patients and in whom have a general comorbidity.

From June 2018 to June 2023 53 patients, aged from 68 to 85 underwent to this treatment.

In all series the pre op MRI without or with contrast medium has been performed, in 37 a neurophysiological examination , i.e. EMG, ENG, PEM, PES , has been performed. In 22 patients also CT of spine has been performed.

The surgery has been carried out under operative microscope, with the fluoroscopic guidance, In 41 patients a mono-lateral decompressive laminectomy has been performed before the bilateral introduction of the Facet Wedges prosthesis. A post operative MRI has been performed in all patients at one month clinical control.

As complications, no mortality , no hematoma no CFS leakage, no radicular damage, have been reported, One case of staphylococcus aureous infection that need a two weeks hospitalization occurred. All other patients have been discharged from the hospital in the second operative day. No hardware displacement occurred immediately post op and at follow up.

At the six months and on one year , when possible, follow up the clinical improvement confirmed by pain control, (VAS, ODI) walking improvement, and subjective opinion has been reported in 52 patients. One case declared insufficient response and underwent to stabilization with instrumentation performed in other center.

282 MINIMALLY INVASIVE CRANIAL AND SPINAL SURGERY DOES IT REDUCES COMPLICATION

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Introduction: Any adverse affect within the 30 day period after surgery for brain and spine surgery is considered to be the complication in neurosurgery . The complication could be in the simple form of a wound dehiscence to the spectrum of reexploration, revision or extension of the same procedure .some complication could lead to deformity or disability and some may be life threatening including loss of life .All surgeons aim at reducing the complication and even total avoidance in almost all cases . Sometimes complication are avoidable , however in certain situation there is a dilemma , whether it's worth to take such complication to achieve surgical goal or to avoid the surgical goal to prevent such complication .Modern neurosurgery is magnification based , localization assisted using modern technique and technology and there is a constant up gradation by the operator training to make it complication proof .However the lack of resources , lack of training as well as experience can hinder achieving such goal.

Material and methods: The author tried to present few case scenario of actual cases where complication been avoided in cases like low grade glioma, brain metastasis , pontine Cavernoma , spinal intradural extramedullary tumor where in a limited series from a developing country with a limited financial situations how the cases with high complication are treated .Minimaly invasive brain and spine surgery also been applied in cases where it's possible and discussion would include whether the complications are avoided in comparison to standard procedure .we have analyzed our case series as we evolved from the standard neuro spinal surgery to minimaly invasive brain and spine surgery, since last 10yr and will present our results .

Conclusion: It is not only the technique , or technology but training and experience with time prevent complication and minimaly invasive approach is the most plausible explanation for achieving such results.

Keywords: Minimaly invasive surgery(:).brain metastasis(;)pontine Cavernoma , spine surgery

283 HOW CAN WE REDUCE THE COMPLICATIONS IN SEVERE MICROSURGICAL AND ENDOVASCOPIC NEUROSURGICAL CASESAVOID

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Introduction: The usefulness of fresh cadaveric exercises is not a question.As in sports, the question in difficult neurosurgical operations is how much we can practice. Relatively few neurosurgeons have access to say 3 transnasal endoscopic surgeries and 3 delicate endoscope assisted microsurgical surgeries per week.

Method: In our department we have introduced daily endoscopic and skull base fresh cadaveric exercises in our department 10 years ago.In the last 10 years we have performed 2500 such surgeries. We have now managed to set up 3 autopsy tables every morning from 6 to 7 a.m.

Results: This allows us to perform these difficult operations with the same efficiency as in the clinics where there is no possibility for daily fresh cadaveric exercise.

Conclusions: A big question in sports is whether a lot of training is less competition or vice versa is more effective.Experience shows that we can achieve both, but in the first 10 years in our neurosurgical life it is better to choose the former to avoid complications. In all the smaller departments, a dissecting room is available. It is important to start the exercises with a prayer to the risen Jesus, so that you can cope well with the daily morning meeting with the dead bodies.

Keywords: fresh cadaver exercises, training, complications in neurosurgery

284 EXTENDED ENDOSCOPIC ENDONASAL APPROACH FOR C1-C2 TRAUMATIC AND INFLAMMATORY LESIONS: LESSON LEARNED AND TECHNICAL NUANCES

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Introduction: Extended endoscopic endonasal approaches (EEA) are increasingly being used to address different types of anterior cranio-vertebral junction (aCVJ) diseases, including rheumatoid arthritis related bulbo-medullary compression, basilar invagination in complex CVJ malformations and non-healed odontoid type II fractures.

Materials and methods: From January 2012 to May 2022, 36 patients affected by aCVJ disorders underwent EEA alone or combined with conventional surgical approaches at our institution. A combined classical anterior transcervical and endoscopic endonasal C1-C2 screw fixation approach for non-union of odontoid fractures was used in 12 cases. A fully endoscopic endonasal decompression and C1-C2 fusion was used in 5 patients affected by CVJ malfomations. EEA was also used in 19 patients with irreducible bulbo-medullary junction compression due to a migrated odontoid process and/or retro-periodontoid inflammatory process. Endoscopic endonasal odontoidectomy was carried out sparing the anterior C1 arch, in order to preserve spine stability or to be used as pivot point for anterior C1-C2 screw fixation. All patients were followed-up by MRI, CT scan and dynamic X-Ray.

Results: An improvement in Nurick scale was observed in all cases. Radiologically, an adequate bulbo-medullary decompression was always achieved. Only two patients developed delayed spine instability, requiring posterior occipito-cervical fixation. Clear bone fusion was observed when anterior endoscopic C1-C2 screw fixation was used. Two patients had a CSF leaks and two patients suffered from a dehiscence of the mucosal incision with secondary healing confirmed at endoscopic outpatient follow-up.

Conclusions: The EEA may represent an alternative approach to conventional open transcervical, posterolateral or transoral approaches. The potential advantages over the standard approaches include less invasiveness, straightforward working angle, enhanced chances of preserving anterior C1 arch, with the possibility for both decompression plus anterior endoscopic C1-C2 fixation/fusion in order to reduce the risk of cranial settling and the need of posterior fusion for spine instability.

Keywords: Skull base; Craniovertebral Junction; endoscopy

285 TECHNICAL CONSIDERATIONS AND LONG-TERM RESULTS OF ENDOVASCULAR VENOUS STENTING TO CONTROL VENOUS HYPERTENSION FROM MENINGIOMAS INVADING INTRACRANIAL VENOUS SINUSES

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Background and Objectives: Meningiomas invading the intracranial venous sinuses may cause intracranial venous hypertension, papilloedema and visual compromise. Sinus resection and graft reconstructions, however, add significant complexity to tumour surgery, with potential for increased morbidity. This study explores whether venous sinus stenting might provide an alternative means of controlling venous hypertension, sustainable over the long-term.

Patients and Methods:Retrospective review of all 16 patients with intracranial meningiomas stented at our institution for venous sinus compromise. At presentation, all had headache and nine had papilloedema. Thirteen patients had one meningioma and three had two or more. Three patients had had previous surgical resections and radiotherapy. One patient had been palliated with a lumboperitoneal shunt and radiotherapy. Median length of clinical follow up 8 years (range 4 months – 18 years).

Results: Venous sinus narrowing was often not confined to the site of meningioma, and bilateral transverse sinus narrowing, reminiscent of that seen in idiopathic intracranial hypertension, was present in seven patients with sagittal sinus meningiomas.

Eleven patients had stents placed solely across sinus narrowing caused by meningioma. Five patients had additional stents at other sites of venous narrowing at the same time: in one across a defect in the sagittal sinus caused by previous surgery, in four others across non tumour narrowings of the transverse sinuses. In one the jugular vein was also stented.

Nine patients developed symptomatic in-stent restenosis at the site of meningioma. Eight had further stenting procedures with variable success in restoring the in-stent lumen. The ninth, with a late partial relapse, is being reinvestigated. Papilloedema resolved in all patients following their stenting procedures. Six patients experienced prolonged and very substantial relief of all symptoms. Five patients had persistent headache despite restoration of the sinus lumen. Five had persistent symptoms associated with resistant in-stent stenosis. There were no significant complications from any of the diagnostic or therapeutic procedures.

Conclusions: In patients who are symptomatic with meningiomas obstructing the venous sinuses, successful stenting of the affected segment can give a good outcome, especially in terms of relieving papilloedema. However, further procedures are often necessary to maintain stent patency, other areas of venous compromise frequently coexist, and some patients remain symptomatic despite apparently successful treatment of the index lesion. Long-term surveillance is a requirement.

Keywords: Meningioma; cranial venous outflow obstruction; venous sinus stenting; papilloedema; idiopathic intracranial hypertension

286 INTRA-OPERATIVE EXTRACORPOREAL IRRADIATION OF TUMOUR-INVADED CRANIOTOMY BONE FLAP IN MENINGIOMA: A CASE SERIES

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Introduction: Extracorporeal irradiation of tumorous calvaria (EITC) can be performed to restore function and form of the skull after resection of bone-invasive meningioma. The aim of this study was to examine the rate of tumour recurrence and other selected outcomes in patients undergoing meningioma resection and EITC.

Methods: We performed a retrospective single-centre study of adult patients undergoing meningioma resection and EITC between January 2015 and November 2022 at a tertiary neurosurgical centre. Electronic medical records were analysed to investigate patient demographics, surgery data, tumour data, use of adjuvant therapy, surgical complications, and tumour recurrences.

Results: Eighteen patients with 11 (61%) World Health Organization (WHO) grade I, 6 (33%) grade II, and 1 (6%) grade III meningiomas were included. Median follow-up was 42 months (range 3 to 88). Five (28%) patients had a recurrence, but none were associated with the bone flap. Two (11%) wound infections requiring explant surgery occurred. Six (33%) patients required a further operation. Two operations were for recurrences, one was for infection, one was a washout and wound exploration, but no evidence of infection was found, one patient requested the removal of a small titanium implant, and one patient required a ventriculoperitoneal shunt for a persistent CSF collection. There were no cases of bone flap resorption and cosmetic outcome was not routinely recorded.

Conclusions: EITC is feasible and fast to perform with good outcomes and cost-effectiveness when compared to other reconstructive methods. We observed similar overall rates of recurrence and lower rates of infection requiring explant compared to the largest series of cranioplasty in meningioma. Cosmetic outcome is universally under-reported and should be reported in future studies alongside other clinical outcomes.

Keywords: Tumorous calvaria; extracorporeal irradiation; meningioma; oncology

287 THE EFFICACY OF BILATERAL DBS WITH DOUBLE TARGETING VIM AND PSA FOR TREATMENT OF ISOLATED HEAD TREMOR

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Introduction: Tremor is an involuntary, rhythmic, and oscillatory movement of a body part. It is a common symptom in movement disorders appearing sometimes in isolation and sometimes in combination with other symptoms. Isolated head tremor is a rare variant of tremor syndromes of which pathophysiology is remain uncertain.When sufficient relief cannot be achieved with pharmacological treatment, Deep Brain Stimulation (DBS) has proven effective for ET (Essential Tremor) and Parkinson's Disease tremor. VIM (Ventromedial Nucleus) has been the main target for tremor DBS surgery but unfortunately, there is a scarcity of data regarding the effect of Vim DBS on rare tremor syndromes, for some conditions limited to a few case reports and sometimes with conflicting results. PSA (Posterior Subthalamic Area), a newer target for DBS surgery lies in the proximity of Vim, it is possible to align the electrode to place electrode contacts in both targets. Double targeting of the VIM and PSA is a rather recent practice, allowing us to stimulate both nuclei simultaneously, or separately. In the current study we decided to apply double targeting to the rare tremor conditions, to decide on the effect and safety of the procedure.

Methods: Between 2019 and 2023, 7 patients with isolated head tremor, treated by the first author and DBS electrodes were implanted bilaterally using the double targeting technique and are included in the present study. Patients' demographic characteristics, clinical aspects are provided with their tremor scores and relevant symptoms are shown in Table 1.

Results: All 7 patients who underwent double targeted DBS surgery recovered with remarkable improvement of tremor symptoms. The outcome at 12 month is presented in Table 1, with the items selected in accordance with their specific condition.

Conclusions: In the current study, double targeting of the Vim and PSA provided a very satisfying degree of tremor reduction in several head tremor syndromes. Further studies are needed to decide on the relative effectiveness of the two targets in relation to combined targeting, as well as on the role of DBS in various rare tremor conditions.

Keywords: Isolated Head Tremor , VIM, PSA

288 ADJUSTING THE BEN-GUN ARRAY INCREMENTS ACCORDING TO RADIO-MORPHOLOGY OF TARGETED NUCLEI

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Introduction: The internal Globus Pallidum (GPi) and Subthalamic Nucleus are the two main targets for movement disorders DBS surgeries. Intraoperative macrostimulation technique provides instant understanding of electrode's position in the substructural homunculus of the nuclei and its proximity to the surrounding tissues like internal capsule. MR studies and intraoperative stimulation techniques have provided us with better understanding of the basal ganglia and its radio-anatomical morphology. It holds great importance for surgeons to place electrodes exactly the therapeutical areas in which much beneficial and less side effects can be produced. This procedure may require intraoperative electrode re-positioning to avoid strong side effects and produce stronger beneficial effects. Postero-anteriorly, the latero-medial projections of the GPi nuclei, pave the way for approximating the internal capsule when electrodes move posteriorly and vice versa. In STN, moving electrode anteriorly cause approximating the IC because of the same axial orientation. The technical approach based on their radio-morphology.

Methods: MRI scans of two patients, operated for Parkinson Disease, were investigated. One patient received GPi and the other STN electrodes. Both patients operated using Leksell Stereotactic Frame, Ben-Gun Microdrive Array and S8 Medtronic targeting software. Each target central, and 2mm off-set Ben-Gun Array alternative trajectories calculated in S8 both with and without 45-degree increment counter-clockwise and vice versa. All anterior, antero-medial for, posterior and posterolateral electrode positions tested intraoperatively with same monopolar current configurations.

Results: For GPi targeting, placing electrodes anteriorly while Ben-Gun drive neutral to Leksell Frame sagittal axis, produce less beneficial effects without causing strong capsular effects compared to central electrode which indicates medial projection of the nucleus postero-anteriorly. When posterior electrode was stimulated, capsular side effect profile increased. When medial 45-degree counter-clockwise increment performed using Ben-Gun Drive, anterior stimulation produced better beneficial effects with tolerably decreased side effect threshold. When same increment performed for STN, both beneficial effects and capsular effect threshold increased.

Conclusions: Intraoperative electrode positioning requires knowledge of anatomical and physiological relations of the targeted nuclei and for each nucleus, electrode re-positioning must be made according to their 3D anatomical topography to produce best results with best physiological and anatomical relevance.

Keywords: GPi, Microdrive, Targetin

ABSTRACTS FROM YOUNG NEUROSURGEONS AND STUDENTS FORUM

289 THE EFFECT OF ACTH4-10PRO8-GLY9-PRO10 ON MALONDIALDEHYDE AND F2-ISOPROSTANE 15(S)-8-ISO-PGF2A EXPRESSION IN SPINAL CORD INJURY RAT

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Introduction: This is an experimental study to analyze the effect of ACTH4-10Pro8-Gly9- Pro10 in rats with mild and severe compression injuries on levels of malondialdehyde and F2-isoprostane 15(S)-8-iso-PGF2α.

Methods: Mild and severe spinal cord compression was performed on 27 subjects, with three groups of samples with control included, divided into 3 and 6 hours after the injury. Spinal cord tissue was taken to determine MDA and F2-isoprostane expression under the microscope, and control samples were compared with models with the distribution of ACTH4-10Pro8-Gly9- Pro10.

Results: In 3- and 6-hours-mild ASCI that ACTH4-10Pro8-Gly9-Pro10 is given, MDA expression was lower (8, 40 ± 1, 94 and 8, 60 ± 1, 67) compared with control (12, 60 ± 2, 6 and 14, 40 ± 1, 81) and severe ASCI that ACTH4-10Pro8-Gly9-Pro10 is given, consistent with the mild, we observed that MDA expression was lower (9, 8±2, 16 and 12, 2±1, 92) compared with control (16, 2 ± 16 and 16, 40±2, 07). For the F2-isoprostane expression, the result was constant with MDA. We observed lower expression of F2-isoprostane both in mild (control: 12, 8 ± 3, 03 and 13, 8 ± 2, 58) compared to ACTH given (5, 0 ± 2, 0 and 7, 6 ± 1, 34) and severe (control: 15, 4 ± 2, 60 and 16, 4 ± 2, 30) compared to ACTH shown (8, 0 ± 2, 23 and 11, 8 ± 1, 64.) 3- and 6-hours after the injury.

Conclusion: Administration of ACTH4-10Pro8-Gly9-Pro10 could decrease MDA and F2 isoprostane expression. Thus, it might become adjuvant therapy for spinal cord injury to prevent further secondary damage.

Keywords: ACTH4-10Pro8-Gly9-Pro10; spinal cord injury; reactive oxygen species; malondialdehyde; F2-isoprostane

290 HONORARY PRESIDENT OF WFNS ALEXANDER ARUTYUNOV (1904-1975) AND HIS IMPACT ON THE DEVELOPMENT OF SOVIET NEUROSURGERY

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Introduction: Alexander Ivanovich Arutyunov founded Neurosurgery Institute in Kiev in 1951 (now the A.P.Romodanov Neurosurgery Institute) which he directed until 1964 when he moved to Moscow as a director of the N.N.Burdenko Neurosurgery Institute (now the N.N. Burdenko National Medical Research Center for Neurosurgery) until his death in 1974. He was also a chair of neurosurgery at the Central Postgraduate Medical Institute (now Russian Medical Academy for Continuous Postgraduate Education) from 1965 on. In 1965 he became a Vice-President of WFNS and then its Honorary President in 1969.

Objective: To analyze Alexander Arutyunov's career in neurosurgery.

Methods: Personal files of Alexander Arutyunov in Moscow archives, oral history, analysis of his published works and papers dedicated to him.

Results: Arutyunov's life can be divided into several periods. In 1929 he graduated from the medical faculty of the North Caucasian State Medical University in Rostov-on-Don. During 1930-1932 A.I. Arutyunov was a clinical resident of the university surgical clinic, which was headed by professor Nikolay Bogoraz. In 1932-1935, he was an aspirant (PhD student) at Moscow Institute of Neurosurgery, headed by N. Burdenko, where he defended his kandidatskaya (PhD) dissertation «Fibrous dystrophy of the skull bones» and started his research, teaching and neurosurgery career. When USSR joined WW2 in June 1941 Alexander Arutyunov was mobilized to Red Army where he was chief surgeon of several (North Caucasus, Southwestern and Ukrainian) fronts until 1945. After the war he moved to Kiev, became a chair of neurosurgery at the V.I.Lenin Kiev Institute for Postgraduate Medical Education (now the P.L.Shupik National Medical Academy for Postgraduate Education), and transformed a psychiatry clinic into Neurosurgery Institute in 1951.

In 1954-1955, he worked in Beijing and became a founder of neurosurgery in China. In 1964, he returned to the Burdenko Neurosurgery Institute as a director and (since 1965) a chair of neurosurgery at the Central Postgraduate Medical Institute. He represented Soviet neurosurgery at WFNS and was elected its Vice-President.

Conclusions: Alexander Arutyunov made a significant contribution to the development of Soviet neurosurgery. His clinical and research interests included military surgery, traumatic brain injury, vascular neurosurgery, pain surgery and neurooncology. He founded a school of neurosurgery. His pupils include Alexander Konovalov (born 1933) who succeeded him as a director of the Burdenko Institute.

Keywords: Neurosurgery; History of neurosurgery; Alexander Arutyunov; Postgraduate medical education; USSR

291 RARE LIKE AN ENGLISHMAN IN NEW YORK - CASE REPORT OF A FOURTH VENTRICLE MENINGIOMA IN A 44-YEAR-OLD PATIENT

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Objectives: Meningiomas are benign tumours originating from the meningial cells. They are considered as a pathology of the arachnoid cap cells being accompanied, sometimes, by CNS disorders, such as focal seizures, increased intracranial pressure or vertigo. Being the CNS's most common benign tumours, they are mainly found in the skull base and convexity as well as in the parasagittal and parafalcine regions. An intraventricular localization is described as infrequent, the fourth ventricle, with its specific choroid-plexus-originated tumour, being by far the least likely to be affected. The rarity of such an occurrence is particularly dangerous, as the tumour is not fully understood, thus mimicking malignant structures, such as hemangioblastoma, medulloblastoma or metatasis. We report a case of a fourth ventricle meningioma in a 44-year- old patient with no prior history.

Materials: The patient complained of a brief loss of consciousness approximately one week prior to presentation. A contrast MRI showed a median, extra-CNS solid mass, situated at the cranio- spinal junction, having a visible mass effect on the neighbouring portion of the cerebellus. Afterwards, a complete neurological examination did not reveal any abnormality/deficit. Given the fact that the lesion was located in a surgically accessible area, a median suboccipital craniotomy was performed, followed by the total excision of the tumoural mass from the cranio- spinal junction, and by a tight suture of the dura mater.

Results: The postoperative evolution, as confirmed by a subsequent CT scan, was favourable, having no complications, and the neurological symptoms were in remission. The patient was neurologically untouched upon discharge. The one-week-long nursing of the surgical wound and monitoring it over 3 months were consecutively indicated and the patient suffered no further damage.

Conclusions: The importance of this case lies in the mystery shrouding this type of tumour, as very few cases have ever been reported. Various dangerous tumoural evolutions, some of them yet to be encountered, can cause significant damage to the patient. A hypothetical cervical extension could have led to significant issues like disabling vertigo or ataxic dysarthria. Another possible complication can be the cranial nerve involvement, notably to the nerves whose nuclei are located in the pons-bulbar segment of the brainstem. The broad spectrum of histological subtypes, difficulty of diagnosis and unique relation to the choroid plexus can also be considered as reasons to show interest in this particular lesion.

Keywords: Intraventricular meningioma; fourth ventricle; extremely rare; excision; tumour; mass effect; suboccipital craniotomy

292 TRANSIENT EXPRESSIVE APHASIA FOLLOWING CEREBRAL ANGIOGRAPHY AND COIL EMBOLIZATION FOR UNRUPTURED ANEURYSM OF BASILAR ARTERY -CASE REPORT

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Introduction: Intracranial cerebral aneurysms represent a neurosurgical pathology with increasing incidence. Cerebral angiography is the key method of diagnosing and treating intracranial vascular lesions. Although cerebral angiography is considered to be a safe method, neurological complications are still possible. This case report aims to show a rare and paradoxical complication of cerebral angiography.

Case description: Male, aged 42, was referred to our clinic for endovascular treatment of an unruptured intracranial aneurysm in the basilar artery, confirmed by cerebral angiography. Upon admission patient had minor symptoms in the form of occasional diplopia. A coil embolization was applied using stent. The aneurism was completely packed with coils. After an uneventful endovascular treatment, the patient had an epileptic seizure upon waking from anaesthesia. Control CT scan was immediately preformed but showed no signs of haemorrhage or ischemic strokes. Patient was sedated, and later extubated. He then presented with sudden onset of expressive aphasia. The patient was treated with hydration and corticosteroid therapy. He began neurological recovery within hours but regained a full recovery after 7 days. Follow-up MRI scan with DWI showed an acute/subacute ischemic stroke in the left occipital lobe, biggest diameter up to 37mm, but no vascular events were detected in other parts of the brain. The patient was discharged fully conscious with no neurological deficit.

Conclusion: Although rare, transient neurological deficit can occur as one of the complications of cerebral angiography and endovascular treatment of intracerebral aneurysms, probably because of contrast medium application. This should be kept in mind, so that adequate treatment can be applied in timely manner to prevent permanent neurological deterioration.

Keywords: cerebral aneurysm, endovascular treatment, aphasia

293 ANALYSIS OF FACTORS INFLUENCING THE DEVELOPMENT OF CHRONIC SUBDURAL HEMATOMAS - BACK TOTHE BEGINNING TO UNDERSTAND THE END

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Introduction: Chronic subdural hematomas represent a frequent neurosurgical condition with an average incidence of 10 to 80 per 100.000 people per year, with a constant increase, especially among elderly patients, but the exact pathophysiological mechanism of origin and development is still not fully known.

Methods and materials: This study included 200 subjects divided into two groups - 100 subjects with unilateral chronic subdural hematomas that were surgically treated and 100 subjects who underwent a CT scan of the head due to suspicion of some conditions and injuries, but the findings were negative. Patients were matched by gender and age. Relative cortical atrophy index (RCA index) developed by Chrzan et al, use of antiplatelet and/or anticoagulant therapy, and chronic alcohol consumption were examined and compared. In addition to the above, demographic factors and data on possible injury methods were also analyzed.

Results: The average age of the patients was 71.3 years, with 36% of the subjects being female and 64% being male. The index of relative cortical atrophy in the group of patients treated for chronic subdural hematomas was 0.206, while in the control group it was 0.09, with a statistically significant difference. As many as 48% of patients in the group with chronic subdural hematomas used antiplatelet and/or anticoagulant therapy, while in the control group that percentage was 24%. Regular consumption of alcohol in the group of patients with chronic subdural hematomas was reported by 35% of patients, while that percentage in the experimental group was 10%.

Conclusion: The results of this study show that brain atrophy expressed by the relative cortical atrophy index, the use of antiplatelet and/or anticoagulant therapy, and alcohol consumption affect the occurrence of chronic subdural hematomas.

Keywords: Chronic subdural hematoma; brain atrophy; antiplatelet; anticoagulant.

294 STARTING NEUROSURGICAL SERVICES IN THE RURAL AREA (INDONESIA - MALUKU - AMBON) – FIRST YEAR EXPERIENCE AFTER FINISHING RESIDENCY

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Starting a neurosurgical service in a place where neurosurgical services are the first to exist definitely has its own challenges. Maluku, or Maluku is a group of small islands in northeastern Indonesia. It is one of 38 provinces in the Republic of Indonesia.

Neurosurgery services have just started, in October 2022. Previously there was no definitive Neurosurgery service in this province. Consisting of more than 1340 islands, this is a challenge in itself for neurosurgery services which require quick action for emergency cases. There have been many challenges faced since the start of neurosurgical services in this province, ranging from a lack of equipment, human resources, also public stigma regarding operations on the head and spine. Various cases have been treated in the last 7 months, including trauma, pediatric, vascular, infection, oncology and spine cases treated at Siloam Hospital Ambon and Leimena Hospital Ambon.

Discussions to exchange ideas with colleagues and seniors are very helpful in dealing with difficult or rare cases.

Keywords: Indonesia; Maluku; Ambon; Starting Neurosurgery services; Young Neurosurgeon.

295 NERVE REGENERATION FROM AN IN SILICO PERSPECTIVE – CURRENT AND FUTURE APPROACHES

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Introduction: Computational models have taken a significant place in medicine in recent years, since they can provide faster response with reduced costs, manipulation with large data sets and have predictive nature in a decision-making tool. In nerve regeneration, computational models can be utilised to simulate the growth of damaged nerves. The goal of these kinds of models is to calculate the size, number and orientation of fibres, with special emphasis on the possibility of finding parameters that will allow maximum neurite growth. Such optimisation can be achieved by applying sensitivity analysis, which will consequently lead to optimising of the accompanying in vitro models.

Methods: Currently, the most common procedure in recovery of injured nerve tissue is implantation of nerve (auto)graft. Since nerves do not possess a good self-healing capability, their regeneration needs to be provoked mechanically or chemically. An appropriate niche for tissue engineering (TE) strategy of nerve graft can be tested easier with in silico models, where different external and boundary conditions can be analysed to provide the best solution for novel TE graft.

Results: In this vein we can adduce an example of in silico model that combined phosphate glass fibres, for directional guidance and corresponding stiffness, and self-aligned therapeutic cells that showed a promising result in prediction of number and radius of fibres that reached the distal end of graft in time. In silico models of microfluidic platforms applied to nerve regeneration, once validated, can be a great asset in evaluating the influence of various drugs on the regeneration process and, in that manner, served as a drug testing platform. Due to a great biological complexity of nerve regeneration, future TE strategy ought to take more thoroughly into account multiple components and their variations, such as 1) scaffold / substrate support, 2) therapeutic cells, 3) extracellular matrix for providing appropriate niche for cells orientation and growth and 4) added growth factors for biological / chemical stimulation.

Conclusion: Added value of in silico models for nerve regeneration can be seen in optimising corresponding in vitro models and translation of the obtained results to the macro scale. Optimisation of the TE design is an important step in reaching the pre-clinical phase of novel regenerative approach. Another advantage of using in silico models lies in testing how various drugs influence nerve regeneration, without ethical concerns. A good collaboration between researchers working on in vitro, in silico and in vivo models might in the near future enable better insight in nerve regeneration at different scales / levels and potentially lead to better and more personalised TE graft design with overall better outcome.

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Keywords: nerve regeneration; in silico models; novel tissue engineered strategy

296 EARLY PATIENT CARE FOLLOWING PERIPHERAL NERVE SURGERY: A BASIC KNOWLEDGE FOR NURSES AND GENERAL PRACTITIONERS

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Proper patient care following peripheral nerve surgery is crucial to prevent complications and promote the best postoperative outcomes. Given the relatively infrequent nature of surgically treated peripheral nerve lesions, nurses and general practitioners, especially in regional medical centers, may not have daily exposure to the nuances of postoperative management for these patients.

The aim of this paper is to present current guidelines and trends in the early-phase postoperative management of patients following peripheral nerve surgery, based on a literature review and personal experiences, with the inclusion of illustrative cases. Patients should receive comprehensive education regarding post-surgical expectations and strategies for managing the extended rehabilitation period. There are four main goals in early postoperative care of these patients: (1) nerve coaptation security, (2) edema reduction, (3) pain control, and (4) complication prevention. Ensuring the stability of nerve coaptation is of paramount importance. While an initial emphasis on immediate postoperative range of motion may alleviate scarring and enhance nerve mobility, sustained immobilization may become imperative to prevent nerve traction and fortify the integrity of the suture line.

Edema reduction is a significant aspect of early postoperative care. Beyond enhancing comfort, it significantly contributes to pain control. In tandem with analgesics, early mobilization and edema management represent instrumental modalities for pain relief. Effective pain management is imperative in the early postoperative phase. Patients experiencing neuropathic pain may warrant referral to multidisciplinary pain management teams due to the complexity of their pain profiles. Meticulous postoperative wound care, including scheduled dressing changes and vigilant inspection, is essential. These measures promote optimal wound healing while minimizing infection risks and complications. Timely recognition and appropriate management of all complications are essential, often necessitating referrals to specialists with the requisite expertise.

In conclusion, the early-phase postoperative care following peripheral nerve surgery is a multifaceted effort aimed at optimizing patient outcomes. Patient education, secure nerve coaptation, edema reduction, pain control, and vigilant complication management are key pillars in this process. These objectives, drawn from a blend of clinical practice and research, collectively contribute to the comprehensive care and well-being of patients on their path to recovery following peripheral nerve surgery.

Keywords: Neurosurgery; Peripheral Nerves; Postoperative Care; Neurologic Rehabilitation; Postoperative Complications

297 THE INFLUENCE OF MORPHOLOGY OF BRAIN ARTERIOVENOUS MALFORMATION - ASSOCIATED ANEURYSMS ON RUPTURE RISK

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Objective: Brain arteriovenous malformations (bAVMs) have a higher incidence of intracranial aneurysms (IAs) when compared to the general population. A reported estimated prevalence of bAVM-associated intracranial aneurysms is around 20% in the literature. In patients with bAVMs and associated IAs, there is a significantly higher incidence of rupture from both the bAVMs and associated IAs. However, the underlying cause remains unclear. Therefore, we investigated the influence of morphology of associated IA on rupture risk in patients with bAVMs.

Methods: After obtaining the consent of the Ethics Committee of the Clinical Center of Vojvodina the patient data was extracted and analyzed. The study was conducted retrospectively for the period from January 2013 to December 2022 including all patients with bAVMs managed at our institution. The data on demographics, clinical history, radiographic evaluation, and performed interventions were collected from the medical history. Patients with insufficient data were excluded from the study and respective statistical analyses.

Results: In total we included 128 patients with bAVMs in our study. Fifty-nine (46.1%) patients were female and 69 (53.9%) were male. Average age was 47 years (range 2-85 years). Fifty-eight (50, 9%) patientswithbAVMspresentedwithhemorrhage.Intraparenchymalhemorrhage(ICH) was the most common in a total of 35 (30.7%) patients, followed by intraventricular hemorrhage (IVH) in 25 (21.9%), subarachnoid hemorrhage (SAH) in 24 (21.1%) patients, and subdural hematoma (SDH) in 5 (4.4%). Unruptured bAVMs presented clinically with focal deficit in 21 (18.4%) patients, seizure in 20 (17.6%), chronic headaches (HA) in 7 (6.1%), other symptoms in 3 (2 .6%), while 5 (4.4%) patients with unruptured bAVMs were asymptomatic. AVMs were graded using the Spetzler-Martin scale and were determined as: grade 1 in 27 (23.3%) patients, grade 2 in 50 (43.1%), grade 3 in 26 (22.4%), grade 4 in 11 (9.5%), grade 5 in 2 (1.7%) patients. Out of a total of 23 associated sIAs, there were 5 (21.7%) intranidal (type III), 8 (34.8%) proximal flow-related (type II A), 6 (26.1%) distal flow-related (type II B), while 4 (17.4%) were flow- unrelated bAVMs (type I).

Conclusions: Results of the present study identified that in both groups of patients with bAVMs and associated IAs and with no associated IAs presented most commonly with hemorrhage, with an increased rate of hemorrhage in patients with the associated IAs. Differences in morphological parameters between ruptured and unruptured bAVMs were observed which may explain the predisposition for hemorrhage in these patients. Further studies on larger patient cohorts are needed to confirm this.

Keywords: arteriovenous malformation; intracranial aneurysm; rupture; morphology;

298 DANDY-WALKER MALFORMATION AND CERVICAL SYRINGOHYDROMYELIA: MICROSURGERY AS A CURE

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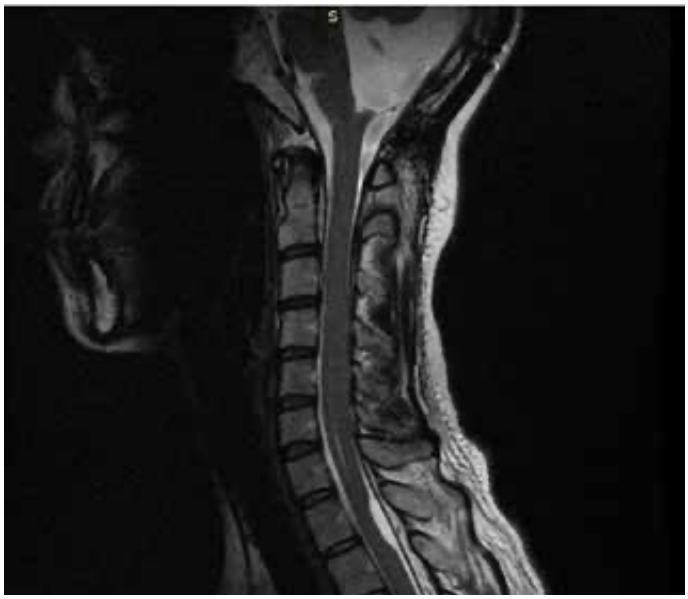
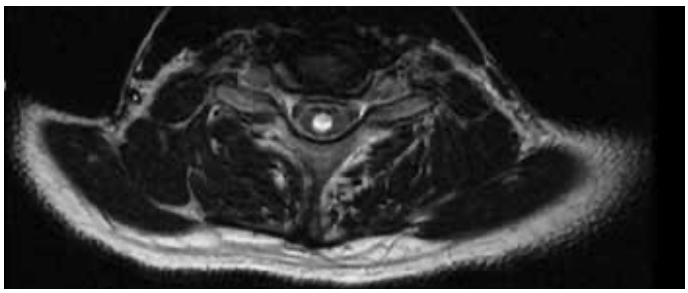
Dandy-Walker malformation (DWM) is a rare congenital anomaly of the cerebellum and consists of vermian hypoplasia, cystic dilatation of the fourth ventricle, and an enlarged posterior fossa. DWM can be associated with numerous syndromic and non-syndromic abnormalities, but associated syringomyelia is exceptionally uncommon. The authors report the case of a 28-year- old woman with Dandy-Walker malformation, previously treated for childhood obstructive hydrocephalus, who presented with cervical syringomyelia with progressive loss of sensation and weakness of the right hand and right arm. Clinical implications and successful surgical technique to restore cerebrospinal fluid flow are discussed.

The clinical association of DMW with syringohydromyelia has been clearly demonstrated, both in the literature and in our report. It is clear that VP shunting may not be a permanent solution in all situations involving craniocervical obstruction. Therefore, considering the pathological mechanisms previously discussed and the fact that the water always finds its level, a surgical solution is undoubtedly required.

We report a surgical solution for an acquired form of cervical syringomyelia. The surgical technique, which involved a CSF drainage and membrane fenestration from the posterior cranial fossa cyst, allowed the pulsations to continue unhindered and released a pressure barrier at the craniocervical level. This type of decompression resulted in syrinx resolution. More research is clearly needed and welcome in this area, however the lack of cases with associated entities makes it more difficult.

Keywords: Dandy-Walker malformation; syringomyelia; hydrocephalus;syringohydromyelia





299 TRANSNASAL TRANSSPHENOIDAL EXTRADURAL CHIASMOPEXY USING ATTAINABLE AUTOLOGOUS MATERIAL IN SECONDARY EMPTY SELLA SYNDROME - CASE REPORT

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Secondary Empty Sella Syndrome (SESS) is a rare condition characterized by the herniation of the subarachnoid space into the empty sella turcica leading to dislocation and impairment in the optic system (nerves, chiasm and tracts). This report represents a case of SESS following cabergoline therapy for prolactinoma causing vision impairment. The patient was surgically treated by endoscopic transnasal transsphenoidal approach and extradural chiasmopexy. The surgical procedure involves repositioning and fixation of damaged optic nerves and chiasm using attainable autologous material from bone and cartilage graft harvested from the nasal septum. The postoperative course was uneventful. The patient's visual impairment regressed on follow up. The use of attainable autologous grafts excludes the need for synthetic materials, reduces the risk of graft rejection additional donor-site surgeries, and postoperative complications.

Keywords: chiasmopexy; empty sella; endoscopic endonasal approach; prolactinoma; pituitary surgery; cabergoline.

300 FRAMEWORK PROPOSAL FOR TRAINING SET OF LOW-SHOT MEDICAL IMAGE DATA IN CEREBROVASCULAR DISEASE

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Cerebrovascular diseases, including white matter hyperintensities (WMLs), are the leading cause of functional disability. Accurate and timely detection of WMLs is crucial for understanding their pathophysiology, progression, and treatment outcomes.

Recent advancements in artificial intelligence (AI) and machine learning have facilitated the development of automatic WML detection methods, enhancing efficacy and accuracy in quantifying, localising, and evaluating lesion characteristics. To cope with the lack of training samples, low-shot (one- and few-shot) learning techniques have been proposed in the natural image domain and achieved encouraging results in both classification, and segmentation tasks. In the low-shot natural image domain, it is often assumed and also practiced that generalizable prior knowledge can be learned on a sufficiently large set of labeled samples of known base classes, and then utilized to boost learning of previously unseen novel classes given limited samples. We included 20 subjects, 10 with WMLs and 10 controls. The data were drawn from the ATLAS MRI (T2 flair) open database, using simple randomization. All images were aligned with MNI space to normalize their intensity. Manual segmentation was then performed with ITK-SNAP using T1v and FLAIR images. Statistical analysis was performed to determine the correlation of lesion volume with the total brain volume (TBV) and to compare the TBV in patients with lesions and controls, in an effort to find possible morphometric correlates that may aid in automatic lesion detection and predicting the spacial pattern of WMLs. Adding to the proposed framework, we have investigated statistical correlates in subjects with WMLs and controls. A statistical analysis was conducted to compare TBV in subjects with WMLs and controls and correlation between WML volume and TBV. The significance of the observed differences is determined, providing insights into the impact of WMLs on TBV. The average WML volume was 179.82±64.43mm3, with the smallest volume measured at 71.19mm3 and the largest at 264.7mm3. A significant difference in TBV was observed between patients with WMLs and controls (p-value=0.00103, $p<0.01$), and a weak negative correlation was found between WML volume and TBV ($\rho=-0.233$).

Our findings demonstrate reduced TBV in patients with WMLs and emphasize the importance of considering parameters such as TBV in evaluating WMLs. This factor can play a role in the pathogenesis of WMLs, in terms of structural abnormalities and reduced cognitive reserve, and can be easily integrated into future algorithms for automatic detection.

Assessing the impact of WMLs on TBV can provide valuable insights into the progression and severity of neurodegenerative diseases, cognitive decline, and functional impairment, but also impact on training dataset preprocessing preparation for AI framework on low shot medical images in cerebrovascular disease. Novel AI neuroimaging techniques, combined with quantitative measures of WMLs and TBV, can be used to investigate these relationships and understand the implications of WMLs on brain structure and function.

Keywords: training set; lesion detection; volumetric analysis; white matter lesions; WML.

301 CORE GROWTH ANALYSIS ON FOLLOW-UP CT PERFUSION IN ACUTE ISHEMIC STROKE

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Introduction: The core growth analysis using the core to time ratio and hypoperfusion index reveals important insights into the progression of ischemic stroke in this patient.

Early recognition and intervention are crucial to minimize the impact of ischemic stroke and treatment strategies should be used based on a comprehensive analysis of right core growth parameters.

Case report: Male patient, 77years old was admitted to emergency room at 11 p.m. with somnolence, left hemiplegia, conjugated eye deviation and NIHSS 23. Patient had residual left- sided hemiparesis after earlier stroke in previous clinical history. On CT at 12.a.m. hyperdense right middle cerebral artery (MCA) was seen. CTA showed tandem occlusion of internal cerebral artery (ICA) and MCA contrast opacification defect, right perfusion defect on CTP with low perfusion volume of 15ml and mismatch volume of 146ml. Because of the lack of stroke team during the night on the control evaluation exam 8 hours later we saw ischemia progression with corresponding data - core ischemia as low perfusion now presented with volume of 151ml and mismatch volume of 148ml, thus excluding him from the potential reperfusion endovascular therapy.

Discussion: Core progression can be evaluated with core to time ratio and hypoperfusion index. The initial core to time ratio of suggests a certain rate of core growth since stroke onset to separate fast from slow rate of progression but earlier publications questioned showed us that it may not be linear, also bringing to the table a potential circadian rhythm of ischemic core progression? Similarly, the hypoperfusion index (HI) provides additional information about tissue at risk by assessing time to peak concetration parameters (tissue likely to become infarcted) and is less reliant on time from stroke onset and can be a good surrogate of collateral circulation. HI is giving us a decision tool for determining the adequate parameter for going into the angio-suite, mostly for the aforementioned patient giving us the better insight into his core ischemia progression.

Keywords: Core Ischemia; Stroke; CTP parameters; Mechanical Thrombectomy

302 NEW-ONSET CAVERNOMA-RELATED EPILEPSY IN CHILDHOOD: CONSERVATIVE OR SURGICAL TREATMENT?

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Introduction: The aim of this study was to investigate the outcomes of children with cerebral cavernous malformation (CCM) and new-onset CCM-related epilepsy (CRE) treated conservatively or surgically over a 5-year period.

Methods: CRE patients treated between 2003 and 2020 and aged <18 were included. Definitive seizure control was classified as International League Against Epilepsy (ILAE) class <2. Functional outcome was assessed using the modified Rankin Scale (mRS). CRE patients were divided into two groups according to treatment method. Seizure control, antiepileptic drug (AED) use, and functional outcome were assessed.

Results: 39 CRE patients were included. 18 (46.1%) patients were treated conservatively, whereas 21 (53.8%) underwent surgery. While functional outcome at last follow-up was similar in both groups, definitive seizure control was better in the surgical group (77.8%) than in the conservative group (25.0%) ($p = 0.038$). Patients who underwent surgery were significantly more likely to discontinue AED treatment ($p = 0.009$).

Conclusions: Surgical treatment of pediatric patients with new-onset CRE had higher rates of complete seizure control and early discontinuation of AED medications than conservative treatment. Neurologic outcomes of patients treated surgically or conservatively were comparable. These results encourage early surgical treatment even in the absence of pharmacoresistant epilepsy, but randomized control trials are urgently needed for further decision-making.

Keywords: Pediatric; Cavernoma-related epilepsy; Conservative; Surgical; New-onset epilepsy.

303 GLYCATED HEMOGLOBIN IN PATIENTS WITH INTRACRANIAL MENINGIOMAS

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Meningiomas are among the most common primary tumors of the central nervous system. Previous research into the meningioma histological appearance, genetic markers, epigenetic landscape and transcriptome has revealed that benign meningiomas have a significant difference in their glucose metabolism compared to aggressive lesions. However, a significant correlation between the systemic glucose metabolism and the metabolism of the tumor hasn't yet been found. Based on our preliminary research, we hypothesized that chronic levels of glycemia (aproximated with glycated hemoglobin (HbA1c)) is different in patients with aggressive and benign meningiomas.

We analyzed 71 patients with de novo intracranial meningiomas, operated on in three large European hospitals, two in Croatia and one in Spain. Our results show that patients with WHO grade 1 meningiomas have significantly lower HbA1c values compared to patients with grade 2 lesions ($U = 641.5$, $p < .05$). We also found a significant number of patients having unrecognized and untreated hyperglycemia, harboring all the risks that such a condition entails. This finding is especially important considering the current routine and wide-spread use of corticosteroids as anti-edematous treatment.

Further research in this area could not only lead to better understanding of meningiomas themselves, but could also have immediate clinical application.

Keywords: Meningioma; Glycated hemoglobin; Glucose

ABSTRACTS FROM NURSING SYMPOSIUM

304 HISTORY OF NURSING IN SERBIA - NEUROSURGICAL NURSES

Žaklina Đurić

1. UKCS - Clinic for Neurosurgery

Florence Nightingale, a British nurse and humanitarian worker, is considered the founder of modern patient care. From her "service for nurses" came Miss Newton, the first director of the "School for Nudists" in Belgrade, which marks the beginning of professional nursing in our country. Florence Nightingale contributed greatly to nursing theory, nursing education, practice, and research, and her works continue to inspire members of the medical profession today. Her "nursing service" produced educated nurses who later opened similar schools in many countries.

"School for nudists"

The medical school at Zvezdara in Belgrade was the first institution of its type in the Balkans. It was founded in 1921 as the "School for Nudists", with the involvement of the Red Cross Society from Geneva and the Red Cross Society from Belgrade, and at the suggestion of Dr. Reeder, head of the American mission. The school was founded for the purpose of educating our medical personnel, who would replace nurses from abroad after they leave the country. The first headmistress of the school was the English Miss Edith Newton, a student of Florence Nightingale. The establishment of the first schools for nurses in our country is a real period of prosperity for our profession.

305 IMPROVEMENT OF INTRAOPERATIVE CARE THROUGH TECHNOLOGICAL PROGRESS IN NEUROSURGERY

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Intraoperative care for the patient is carried out from the moment the patient is admitted to the operating room until the transfer of the patient after the operation to the recovery room. The methods and procedures that are today in daily use for the implementation of intraoperative care are extremely complex and require operating nurses to have, in addition to the knowledge of special clinical skills, the knowledge and operation of highly sophisticated computerized devices used in neurosurgery. Namely, neurosurgical treatment and its results are increasingly based on high technology and the philosophy of "minimally invasive neurosurgery". It made it possible to carry out the surgical treatments in a much faster and safer way for the patients. The main task and the activity of the nurse is to take care of the patient's safety in the operating room environment, so that the surgical procedure can take place safely and without complications. This security has certainly been improved by the integrated operating room, which is characterized by numerous functionalities, from the most technologically advanced devices to the system for storing documentation related to the data of the patients who have been operated on, such as image and video materials of the operation itself, while respecting high standards of the data protection. This video storage system of all off the neurosurgical operations was improved by the "N care" system. It enabled the storage and secure availability of video material to all who are authorized to use it for educational purposes.

The complexity of nursing work in the intraoperative care, the responsibility related to aseptic conditions during surgical procedures, as a prevention of possible infection, requires formal training for these nurses. We still don't have such education for now. The University of Applied Health Sciences together with the professionals in the field created all the prerequisites for starting a one-year education for this important segment of nursing activity.

Accelerated technological changes and progress in the medicine demands from the instrument nurses the need for lifelong learning as the only way to keep up with the changes.

Keywords: instrument nurse, education, new technologies

306 IMPORTANCE, ROLE, EXISTENCE AND FUTURE PROSPECTS OF NURSES IN NEUROSURGICAL TEAMS

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Introduction: Neurosurgery is a branch of surgery that deals with the operative treatment of diseases of the skull, brain, spine and nerves. A very important role in the work of the neurosurgery department is played by nurses, including the care of patients with head injuries as well as patients with incurable pain, work in the intensive care unit, patients with a specified neurosurgical disorder, such as a head injury.

Objective: To examine how important the role of the nurse in neurosurgery and neurosurgical teams is for patient care.

Results: A very important role in the work of a neurosurgical nurse is played by cooperation with other members of the health care team, thus ensuring optimal results for patients

Conclusion Neurosurgery nurses need the following skills in order to be successful: good communication with the patient and the team they work with, monitoring vital parameters, accurate record keeping, constant education.

Keywords: Contemporary nursing in neurosurgery

307 COMMITMENT TO PAIN MANAGEMENT FROM A NURSE/ TECHNICIAN PERSPECTIVE

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Pain is a physical experience that is transmitted from sensory nerve cells through the spinal cord to the brain, where the sensation of pain is registered. Each person experiences and endures pain in a different way. The sensation of pain conveys information about inflammation, organ dysfunction, tissue damage or trauma. Pain affects the mental and physical behavior of an individual, and their organism tries to find a way to prevent the feeling of pain as soon as possible and thus further damage, which is why experts consider it the fifth vital sign. The International Association for the Study of Pain (IASP) defined pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described at the time of such damage. The most important division of pain is according to cause, location and duration (chronic or acute pain).

Measuring pain helps us to determine the type of pain, its duration and intensity, and all of this helps us to make a diagnosis and a plan to prevent and eliminate pain. In order to know that we are using the right way of suppressing pain, assessment is important from the beginning of treatment, during the implementation of interventions and pain evaluations. Questionnaires and scales are used to help assess pain, which give us information on when the pain started, how long it lasts, the intensity of the pain, the localization and the quality of the pain, and the patient shows us this with verbal and non-verbal signs.

The patient, family and medical staff are involved in the process of preventing and stopping the feeling of pain. The health personnel who spend the most time with the patient are nurses and technicians. Dedication to the patient and their needs is considered one of the main characteristics of nurses, and suppressing the feeling of pain is their great challenge. Nurses/technicians assess the patient's condition, their behavior, grimaces, movements and listen to every word patient verbalize; they establish and keep records of pain, teach about pain, plan and apply non-drug pain relief procedures, monitor the success of pain relief. Sometimes the patient will not verbalize the pain due to fear, insecurity, new space and situation, but that is why nurses and technicians must be able to read and recognize the feeling of pain in a timely manner and react.

The goal of pain treatment is for the patient to verbally or non-verbally indicate that they are in less pain, to completely remove the sensation of pain, and to maintain the quality of life and normal functioning.

Continuous education and training of health personnel is necessary because pain control requires a combination of different procedures, such as: drugs, surgical procedures, psychological methods and physical therapy. In addition to the education of health personnel, it is important to educate patient who will be able to recognize all symptoms in a timely manner, thus improving and protecting their health and preventing the onset of diseases and complications.

Keywords: pain, type of pain, pain assessment, nurse, education

308 HEALTH CARE OF POLYTRAUMATATED PATIENTS

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Introduction: Trauma is acute damage to the organism by the action of an external force with tissue destruction and accompanying functional disorder. Polytraumatized patients represent a significant population of emergency and potentially life-threatening patients, and knowledge of the complex diagnostic and therapeutic approach of severely injured patients is one of the most relevant contemporary topics for medical workers of all profiles.

The golden rule is the urgent collection of the injured from the moment of injury during the "golden hour" period. In order to increase the survival rate and reduce complications in polytraumatized patients, it is necessary to know modern algorithms for the treatment of severely injured patients.

The goal of the work: 1. Presentation of standard procedures in hospital treatment of the seriously injured, 2. Presentation of health care and nursing activities.

Conclusion: Treating a polytraumatized patient requires knowledge and skill, and involves teamwork, from the place of injury, to care and definitive treatment in a highly specialized institution with a multidisciplinary approach to the injured.

309 MANAGEMENT AND COMMUNICATION WITHIN A MULTIDISCIPLINARY TEAM

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Summary: Good communication between doctors, nurses, patients and other team members is a key element for adequate patient care. The goal is for everyone to feel more comfortable in each other's environment and thus more easily participate in joint decision-making. Good teamwork management is essential for patient safety. In the paper, I will present the forms of communication within the team and its management.

310 HEALTH CARE OF PATIENTS WITH PARKINSON'S DISEASE

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Parkinson's disease is a progressive disorder that affects the nervous system and the parts of the body controlled by the nerves. Symptoms start slowly. The first symptom may be a barely noticeable tremor in just one arm. Tremors are common, but the disorder can also cause stiffness or slowness of movement. The most obvious early symptoms are tremors, stiffness, slowness of movement and difficulty walking.

Cognitive and behavioral problems can also appear with depression, anxiety and apathy. Parkinson's disease is a clinical diagnosis, that is, the diagnosis is made based on a recognizable clinical picture. There are no laboratory tests that would confirm it. Although Parkinson's disease cannot be cured, drugs could significantly improve symptoms. The most common drug of choice for treating Parkinson's disease is levodopa. Sometimes a doctor may suggest surgery to regulate certain regions of the brain and improve symptoms. Parkinson's disease is a growing source of disability and mortality among neurological disorders. The estimated prevalence is about 0.3 percent in the general population between the ages of 40 and older.The nurse is an important member of the multidisciplinary team that cares for the patient with Parkinson's disease. During the hospitalization, the nurse will enable the patient to meet all his needs and educate him on ways to make it easier to perform daily activities. In addition, it provides support to the patient and his family in coping with the newborn situation.

Keyword: Parkinson's disease, parkinsonisam, levodopa, health care

311 CARE OF NEURO-ONCOLOGY PATIENTS AS A BASIS FOR IMPROVING THE CARE OF ALL DIFFICULT AND COMPLEX PATIENTS

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Introduction: Neuro-oncology patients often suffer from complex disability due to the multiple neurological deficits that affect them. Modern treatment modalities significantly prolong life, so the need for care and rehabilitation is increasing. The figure of the medical technician in the interdisciplinary approach is not clearly defined, but their role is certainly recognized as crucial. The purpose of the study is to identify standard competencies for medical technicians specializing in this patient group.

Methods: Based on the institutional experience and literature review, the goal is to define an educational model that would prepare the staff to work with this extremely difficult group of patients.

Results: Five main areas were identified: clinical aspects of care; techniques; methodology; relational and organizational models and legal aspects of care.

A course that includes these areas could be included in basic nursing education programs and also in specialist education programs for graduate nurses. Developing expertise in neuro-oncology care will be of critical importance for improving care in general, and especially for patients with very complex ailments such as neuro-oncology patients.

Conclusion: The literature shows that the development of neuro-oncology care depends on improving the theoretical and practical knowledge of healthcare workers. Specialized courses could improve both general and specialist care.

312 ARTIFICIAL INTELLIGENCE AND VIRTUAL REALITY

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Introduction: Artificial intelligence-powered medical technologies are rapidly evolving into applicable solutions for clinical practice. Deep learning algorithms can deal with increasing amounts of data provided by wearables, smartphones, and other mobile monitoring sensors indifferent areas of medicine. Currently, only very specific settings in clinical practice benefit from the application of artificial intelligence, such as the detection of atrial fibrillation, epilepsy seizures, and hypoglycemia, or the diagnosis of disease based on histopathological examination or medical imaging. The implementation of augmented medicine is long-awaited by patients because it allows for a greater autonomy and a more personalized treatment, however, it is met with resistance from physicians which were not prepared for such an evolution of clinical practice. This phenomenon also creates the need to validate these modern tools with traditional clinical trials, debate the educational upgrade of the medical curriculum in light of digital medicine as well as ethical consideration of the ongoing connected monitoring.

Aim: The aim of this paper is to discuss recent scientific literature and provide a perspective on the benefits, future opportunities and risks of established artificial intelligence applications in clinical practice on physicians, healthcare institutions, medical education, and bioethics. Discussion: As reported in several studies, electronic health records can be an important administrative burden and a source of burnout, a phenomenon that is increasingly present among physicians. Although solutions are becoming increasingly capable of helping the physician deliver complete medical records, further solutions are needed to address the issue of increasing time devoted to indirect patient care. One of the major obstacles to the adoption of intelligent medical technologies by health workers is the fear of dehumanizing medicine. This is mainly due to the increasing administrative burden imposed on healthcare professionals.

Conclusion: The implementation of artificial intelligence in clinical practice is a promising area of development, that rapidly evolves together with the other modern fields of precision medicine, genomics and teleconsultation. While scientific progress should remain rigorous and transparent in developing new solutions to improve modern healthcare, health policies should now be focused on tackling the ethical and financial issues associated with this cornerstone of the evolution of medicine.

Keywords: artificial intelligence, medical technologies, clinical practice.

313 THE SCOPE OF THE NURSE'S WORK IN THE ADMISSION AMBULANCE OF THE NEUROSURGICAL CLINIC UKCS

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1. UKCS Neurosurgical Clinic - Outpatient clinic

The Clinic for Neurosurgery is an organizational unit of the University Clinical Center of Serbia and the teaching base of the Faculty of Medicine in Belgrade.

Neurosurgery is a branch of surgery that deals with surgical and neurosurgical treatment of diseases of the skull, brain, spinal cord, spine and nerves.

The reception clinic of the neurosurgical clinic is part of the polyclinic reception block where the first contact with the patient is made. At the reception itself, the nurse takes the referral, health card, identity card and accompanying medical documentation. The medical history opens. Depending on the condition of the patient, the nurse establishes communication with the patient or the next of kin.

Before entering the EKG room, the patient dresses in pajamas, personal belongings are returned to relatives, if possible. And if not, the wardrobe person takes the things to the wardrobe and is issued on the reverse side for the same.

During the work of the ECG, the nurse relaxes the patient with a nice demeanor, calmness, and a gentle smile and directs him to the further treatment protocol through conversation. After that, the patient is referred for a neuro-ophthalmological examination.

In the case of an unconscious patient or a patient who is unable to move, he is transferred to a sitting or lying-down trolley and carried to the ward with the help of a transport worker. In the case of a life-threatening patient or a transfer from UC, the reception protocol is faster because it requires a faster response and is immediately carried to the intensive care unit, and the administrative procedure and other examinations are completed afterwards.

At the end of the hospitalization, after closing the medical history, the nurse gives the discharge list. It provides information about the control examination.

Keywords: Nurse, ambulance, reception

314 THE SCOPE OF WORK OF A NURSE IN THE DAY HOSPITAL AT THE NEUROSURGERY CLINIC OF THE UKCS

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1. UCCS Clinic of Neurosurgery - Day hospital

The concept of working in the Day Hospital represents getting closer to the patient, providing different diagnostic methods and treatment without leaving the family and work environment. Services are provided at scheduled times, short and planned stays during the day. Treatment methods are: surgery, chemotherapy, oral and intravenous drug administration (symptomatic, corticosteroids, antibiotics) and physical therapy. The activities of the Day Hospital are the treatment and follow-up of neurosurgical and oncological patients. At the Day Hospital, patients are cared for by a multidisciplinary team consisting of: neurosurgeon, oncologist, anesthesiologist, radiologist and nurses.

Nurses play an important role in this team. They are the ones who first come into contact with patients and get to know them. They take orders from the doctor to perform the action, which they know how to perform, which is expected of them. It is very important to emphasize that they are familiar with the possibilities of complications and side effects. With their kindness and smile, they try to prepare the patient for the intervention. Nurses must be professional, have certain competencies, knowledge and thus instill confidence in the patient.

First, the nurses must prepare the equipment and space, and then proceed to the intervention. Regarding the work with the patient in the Day Hospital, it is necessary to have a lot of empathy, not only towards the patient but also towards the family members of the patients with whom the nurses communicate. They strive to provide patients with a pleasant atmosphere during treatment, so nurses and patients often bond. As the patients, together with their families, are under a lot of stress, the nurses explain in a way they can understand what to expect in the coming period, why and in what way the nurses will cooperate with them.

With these procedures, they are educated about the planned treatment, possible complications, as well as the outcome of the treatment, and contribute to the improvement of their quality of life. We must not forget that the patient is a person with physical, psychological, social and spiritual needs and that the nurse should assess all his problems and try to help him solve them by stimulating, motivating and encouraging the patient to take a leading role in his own treatment.

A nurse in the Day Hospital must also be a good economist, take care of the administration and everything done for the patient. She must know how to react very well in a given situation, perform triage of patients, be a good colleague, choose her words so as not to hurt someone, and if it happens unintentionally, she must know how to say: "I'm sorry". In order to be able to respond to all the above-mentioned obligations in the Day Hospital, the nurse must have great knowledge, will, warmth and desire for her own education.

Keywords: Day hospital, nurse, patient, professionalism, empathy

315 STEREOTAXIC RADIOTHERAPY OF BENIGN CNS CHANGES ON LINAC

Dragana Vukašinović

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By installing the system for Stereotaxic Radiotherapy and Radiosurgery Varian EDGE in the University Clinical Center of Serbia Belgrade, November 2018 it was possible to implement SRT/SRH according to the highest standards. The system consists of LINAC, which is equipped with an optical system for repositioning the patient on the patient's skin (SGRT system), a system for respiratory techniques (RPM), system for monitoring the movement of organs marked with transpoders in real time (Calypso), HyperArc system for planning, 6D patient table and a specific system for positioning and immobilizing patients for CNS treatment.

In the period November 2018-November 2022, 116 patients with benign changes were treated: Meningiomas-88, periorbital muscles-22, schwannomas 6. The therapeutic dose is 20-30 Gy distributed in 4-5 fractions for Meningiomas, 20Gy in 10 fractions for periorbital muscles and from 20-40 Gy in 5-10 fractions for schwannomas.

For SRT/SRH treatment of the CNS, it is necessary to ensure a maximally safe position and rigid and at the same time acceptable immobilization for the patient, taking into account the patient's condition and the demandingness and duration of the procedure. The system for positioning and immobilization for SRT/SRH CNS is for this purpose. The system consists of a specific mask, the so-called double shell - a mask for the head (lower mask) and a mask with an opening for the face (upper mask). the face has specific moving pins that allow the mask to be adjusted to the shape of the patient's head and face and submillimeter repositioning for treatment. The bite block is also an integral part. The SGRT system (using the skin surface for precise repositioning) is used for submillimeter accurate repositioning.

The patient is positioned in supination with mandatory knee and foot pads to prevent lateral movement of the head. A cap is placed on the patient's head to prevent hair/skin from sticking to the mask. After modeling the mask, the cap is removed and the mask with an opening for the face is made. The ends of the mask must go all the way to the face to prevent free space and lateral movements. The bite block fixes the position of the head in a maximally neutral position - the head must not be in great flexion. Patients without a dental row cannot use a bite block, which can create problems when repositioning in the direction of the AP axis. This type of mask has an opening for hair on it, which facilitates the treatment of patients with long hair. Also, these masks can be used in children over 5 years of age.

For therapeutic treatment, the patient is placed in the therapeutic position from the simulation. Repositioning for treatment is performed with the help of the SGRT system - the face is the surface used in the system for accurate repositioning. In the SGRT system, a region of interest is defined, which should coincide with the parameters movements from the therapeutic plan. Repositioning is done by standard movements of the therapy table according to the parameters of the SGRT system with possible corrections using specific movable pins. The advantage of these pins is that the repositioning is carried out without removing the mask from the patient or additional movements of the head. In the system, the limit for exact repositioning is 2mm

316 ACTIVITIES OF THE NURSE IN THE NEUROSURGICAL AMBULANCE OF THE EMERGENCY CENTER

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1. UKCS Emergency Center, Neurosurgery clinic

Nurses and technicians work to improve health, disease prevention, treatment and rehabilitation. Their profession requires expertise, humanity, quick and correct reaction in treatment and assistance in emergency situations. They work in different workplaces such as emergency reception services, intensive care units, instrument and anesthetists in operating rooms, ward nurses as well as primary health care in patronage and health centers. They help their patients in alleviating and solving the health problems they have due to the disease.

The nurse technician in the neurosurgical clinic of the Urgent Center triages patients and admits them in order of urgency. Enter personal data in the protocol such as name, surname, age, time of entry to the outpatient clinic, protocol number and other general information such as (LBO, registration number of the booklet, address), mechanism of injury, diagnosis, requested diagnosis and time when the patient was diagnosed review and where further directed, enter the codes of services performed. Dissolves the given medication and suture material. Keeps records of hospitalized patients and their diagnoses, as well as the number of patients in the ward and intensive care, as well as records of the total number of examinations, admissions, surgery and patients referred to other health institutions in 24 hours. It assesses the state of consciousness and the degree of urgency. Takes a nursing history and informs the physician of her observations.

Prepares the patient for the examination and assists the doctor during the examination. Organizes or accompanies the patient herself during diagnostic procedures. He takes a blood sample for laboratory analysis and blood group, and by order of the MUP he takes blood for an alcohol test. Prepares the patient and material for the lumbar puncture and assists the doctor in the same. He measures vital parameters, places the venous cannula and keeps the venous path open, applies the prescribed therapy. Performs wound treatment independently: toilet excoriations and prepares the wound for suturing.

If the wound is in the hairy part of the head, shave the hair around the wound and garnish the field around it. Then it is processed using pean and sterile swabs with hydrogen and iodine if there is no allergy to iodine. Then he prepares instruments for suturing and assists the doctor in suturing the wound, after which he puts a bandage on the head. Washes and prepares instruments for sterilization. He makes gauze and swabs, which he packs in drums and takes to sterilization He cares about correctness medical devices as well as disinfection of work surfaces. Performs sterilization control (daily and periodic). Purchases and orders consumables and medicines. He takes care of the shelf life of medicines. Fills out the therapy order. Monitors the state of consciousness and pupils in observed patients. It organizes translation to other institutions as well as to the home address. As soon as the patient is admitted for hospital treatment, the opening of the medical history, dressing and departure are arranged the patient to the ward. Assists the doctor in examining the patient in the resuscitation clinic, the yellow zone and the green zone of delayed emergency.

Visits observed patients and reports to the doctor about their condition. Receives and assists the doctor during the examination of the injured child. Participates in effective

taking care of patients in mass accidents, with war injuries, ethylicized and aggressive patients, agitated and patients with self-harm (suicide). For the purpose of education, it holds lectures, seminars and congresses, and in the case of various types of epidemics, it carries out health education work.

Keywords: clinic, reception, nurse

317 MODERN NURSING INTERVENTIONS IN THE POSTOPERATIVE COURSE OF PATIENTS WITH BRAIN ANEURYSMS IN THE INTENSIVE TREATMENT UNIT

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Introduction: Cerebral aneurysms are abnormal expansions of cerebral arteries at the point of their branching. Aneurysms are created as a result of incomplete obliteration of the embryonic beginning of vessels. Another change that can cause rupture of the maneurism is ISCHEMIA. The most serious and important consequence of aneurysm rupture is subarachnoid hemorrhage (SAH). The most common are saccular aneurysms, which are of the greatest surgical importance. Aneurysms with a diameter greater than 2.5 cm are called giant aneurysms. A special diagnostic and therapeutic problem is the existence of two or more aneurysmal creations.

The following forms are most common: Focal neurological attacks, Epilepsy, Transient ischemic attack (TIA). Diagnostic procedures are: Computed tomography, magnetic resonance and digital cerebral angiography. As a member of the team, the nurse implements and plans procedures in the field of health care. Interventions in the care of patients with brain aneurysms are numerous and require the knowledge and skills of a nurse acquired by working in an intensive care unit. The health care of a neurosurgical patient in the early post-operative period is focused on monitoring the patient's condition, the first two hours after admission from the operating room to the so- called intensive care unit. "preventive", the appearance of the pupils, the mobility of the body, the care of the toilet tube and the oral cavity. Control of pressure, temperature, timely recognition of potential complications.

Health And Educational Work And Education: Health-educational work with operated patients is a process of learning through experience. It involves the process of translating what is known about health and everyday behavior. Education is individual for each patient and is therefore the key to a good and adequate life outside the hospital. Nurses as members of the health and rehabilitation team, by applying specific health care procedures, significantly contribute to increasing the degree of functional independence of persons with impaired functional ability, temporary or permanent, which leads to the ultimate goal of rehabilitation.

The process of health care and the level of competence in nursing care is the basis of standards in care. The most important area of a nurse's work is the health care process, which should meet the basic standards and procedures related to the quality and safety of services. An important aspect is the health and educational work of the patient.

Standards And Professional Achievements: Working according to standards, the nurse plans, programs and implements her activities according to the needs and expectations of the patients and in accordance with the diagnostic and therapeutic goals. At the Clinic for Neurosurgery, rehabilitation is carried out for patients after aneurysmal subarachnoid hemorrhage in the acute term.

Conclusion: Thanks to the procedures carried out during the treatment and care of patients operated on for brain aneurysms, their return to the community will be achieved, and for those engaged in work, it will be possible to return to the current radon place. In working with patients, the nurses showed exceptional knowledge. Continuous medical education, which takes place several times a year, contributes to this.

Keywords: Aneurysm, care, nurse

318 THE ROLE AND IMPORTANCE OF THE NURSE IN THE CARE OF NEURO-ONCOLOGY PATIENTS DIAGNOSED WITH A BRAIN TUMOR

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1. University Clinical Center Kragujevac

Introduction: Brain tumors represent localized changes that occur in this organ. They can be benign and malignant according to the type and according to their origin, tumors can be primary and secondary, i.e. metastatic, which means that they primarily appeared on another organ but metastasize to the brain. The diagnosis of the tumor is made after the performed dg. procedures such as CT, MR, ophthalmological examination, analysis of cerebrospinal fluid... After the tumor is diagnosed, treatment begins, which can be invasive or non-invasive. Invasive treatment involves surgical removal of the tumor, while non-invasive methods include the use of chemotherapy and radiotherapy.

Goal: The goal is to determine the best and most effective methods in the care of patients diagnosed with a brain tumor and to improve the patient's quality of life.

Conclusion: The role of the nurse is specific and is based primarily on psychological support and specific care for these patients and physical care, which includes preoperative preparation and postoperative care after surgery. The role of the nurse must be directed towards the patient with a holistic approach and respect for the patient's individuality

Also, the nurse's role must be directed towards care, observing such patients, providing emotional support, but also later improving the quality of life with the indispensable support and influence of the family, doctor, psychotherapist...

Keywords: brain tumor, nurse's role, patient care

319 ADVANCMENTS IN NEUROSURGERY: LOOX TECHNOLOGY AND THE ROLE OF NURSES AND TECHNICIAN IN SPINAL FIXATION

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1. University Clinical Hospital Mostar

Neurosurgical procedures are extremely complex and require a high level of precision.

New instruments technologies and approaches mean that neurosurgens and their team can better prepare for surgeries. Less invasive procedures and improved postoperative treatments help patients return to normal life more quickly. Loop x provides higher – resolution images compared to traditional x ray and reduced radiation exposure. In essence, loop x is connected to neuro – navigation, which enables the neurosurgeon to have a visual representation of the spine and plan screw placements. The role of nurses and technicians involves preparing the surgical equipment, assisting the surgeon, and maintaining overall sterility.

Objective of the work: in this paper, I will present to you what loop x is, how it connects to neuronavigation, and the instruments use in the surgery.

320 HEALTH CARE OF PATIENTS WITH PERIPHERAL NERVE INJURIES

Svetlana Delić

1. UKCS - Clinic of Neurosurgery

Peripheral nerve injuries can be divided into open and closed, and based on etiological factors into:

Lacerations and contusions, Traction injuries, Compression-ischemic injuries, Injuries by electric current.

Specific injuries: Iatrogenic injuries (drug injection injuries, radiation injuries, injuries during positioning of patients under anesthesia, direct intraoperative injuries), Sports injuries.

The following parametric parameters are important for establishing a diagnosis of an injury to a certain peripheral nerve: Anamnesis (mechanism of injury, symptoms and their clinical course), • Local finding (localization and extension of the wound), Clinical tests.

EMNG (Electromioneurography) is applied as a supplementary diagnosis; high-resolution ultrasonography and MR neurography. Health care of patients with peripheral nerve injuries includes:After the surgical intervention itself, the patient continues his treatment in the intensive care unit. The basic tasks of the nurse in such patients are: monitoring vital parameters and the general condition of the patients. After detailed intensive monitoring, the patient is placed in the ward. The tasks of the nurse are to monitor the vital parameters, special emphasis is placed on the body temperature, check whether the wound has not festered, if he notices any change on the bandage or around the wound, he immediately informs the neurosurgeon, depending on the localization of the injured nerve, he helps the patients starting with personal hygiene, feeding, bathing, help when getting up or performing physiological needs.

321 STANDARDS AND NORMS IN THE PREVENTION OF CARPAL TUNNEL SYNDROME

Mirjana Dacković

1. Dom zdravlja Obrenovac - Polyvalent patronage service

Introduction: During their journey, from the spinal column to muscles, skin and other organs, nerves pass through various narrow channels. Sometimes, during life, these channels become too narrow, leading to pressure and nerve damage. The causes are different and depend on the location. Pain is an integral and inseparable part of man and an inevitable companion of human life. It can precede the disease, can go along with it or be its chronic complication. All sensations in our body depend on the impulses that are created by the appropriate stimulation of the receptors and further conduction to the CNS.

Carpal tunnel syndrome “computer hand”

Neurocompression syndrome on the median nerve in the area of the carpal tunnel

- Pain and tingling in the first three fingers
- 2-3 times more common in women
- It also occurs in rheumatic patients, in diabetics, in those who firmly grip objects with

their fists during work or lean on their hands.It occurs more often after fractures in the wrist, following pregnancy, menopause, but also all conditions that lead to swelling in the wrists. Carpal tunnel syndrome is one of the most widespread injuries at work and a frequent cause of work incapacity. The culprit is poor workplace ergonomics.

Symptoms

- Decreased sensation in the area of the hand that innervates the nerve
- The pain also occurs at night
- Feeling of tingling and burning
- Weakness and muscle atrophy also occur
- The pain lasts for about an hour and a half, and then it stops
- Pain and tingling may spread to the elbow and shoulder There are three different forms:
- Acute where the cause is mostly trauma with a fracture of the bones of the wrist or the distal part of the forearm
- Chronic when there is thickening of the retinaculum carpalisa (trauma) and hypertrophy • Essential where there is a narrowing of the canal, so moving the arm in the direction of
- extension irritates the medial nerve.

Treatment

• For milder forms, physical treatment and conservative therapy

Conservative procedures include immobilization, local application of corticosteroids and avoidance of chronic, repeated traumatization, wearing specific splints at night

- In case the cause is mechanical compression - surgical, performed on an outpatient basis under local anesthesia - Physical therapy - two weeks
- The disease can return
- Major nerve damage can occur half a year after the onset of symptoms.

Prevention

- Use an ergonomic keyboard
- Do not rest your hands and/or rest them on the table
- Use hand pads
- Take short breaks every 15 minutes
- Take longer breaks every hour
- Limit typing time
- After typing, rest your hands in your lap or let them go down your body • Regularly perform stretching exercises at the workplace.

Research

As the first symptoms, the patients mentioned reduced feeling in the hand, tingling, pain in the hand during the night

- The most common diagnostic methods are X-ray of the cervical spine, EMNG and CT • In 60% of cases, surgical treatment is suggested
- Regarding information, 20% were well informed, 60% knew little, while the other 20% were not informed about this disease.
- In 46.7% of patients, the disease occasionally affects daily activities.

322 SPECIFICITY OF HEALTH CARE IN PATIENTS WITH SPINE TUMOR (CASE REPORT)

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Summary: The topic of the paper is a presentation of the case of a patient who comes to the neurosurgery clinic of the SKB Mostar for the removal of a tumor in the region of the spine. We will present the nursing history, postoperative care, nursing interventions and care plan for the patient from the moment of arrival until the last day in the hospital. In the paper, we will deal with the case of a patient who has been operated on a couple of times and the specificity of care and rehabilitation.

323 BEFORE AND AFTER SURGICAL CARE AT THE NEUROSURGERY CLINIC

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1. SKB Mostar

Summary: In this paper, we will discuss the topic “Before and after surgical care at the neurosurgery clinic”.

The aim of the paper is to explain the process of preparing the patient for surgery as well as possible in order to make it as successful as possible, but also the post-operative process, which is extremely important in the operative procedure itself.

324 THE ROLE OF THE INSTRUMENT TECHNICIAN IN THE OPERATION OF THE LUMBAR SEGMENT OF THE SPINAL COLUMN

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Operative treatment of diseases of the spinal column requires a good knowledge of the anatomy of the musculoskeletal system, as well as precise preparation of nerve elements.

The spectrum of operations includes direct decompression of nerve elements, through complex microsurgical operative techniques, to instrumentation and fixation of vertebrae.

Therefore, good communication between the operator, the anesthesia team, the radiology technician and the nurse in the operating room is key. The role of the nurse in the operating room is primarily to integrate the work of the entire team, as well as to facilitate the smooth flow of the operative procedure itself.

The work of the instrument technician begins even before the operation, by checking the sterility of the instruments and preparing the instruments for the operation, checking the correctness of the apparatus, setting up the table with the instruments. The operation requires a box with instruments for the spine, which consists of basic instruments and special retractors for the spine, kerison and paja.

Our role, in addition to preparation and instrumentation, is to take special care of the sterility of the operative field during the entire operation.

325 ST. POST FRACTURAM VERTEBRAE - PATIENT HEALTH CARE ACCORDING TO VERTEBROPLASTY

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Summary: One of the most common causes of compressive fractures in the thoracic and lumbar spine is osteoporosis, which leads to chronic pain, deformities, kyphosis, and a decrease in height. The frequency of osteoporotic changes increases with age, and vertebral fractures are more common in women over 60.

Vertebroplasty is a stabilising surgical procedure in which bone cement is percutaneously injected into the fractured vertebral body using a needle.

In the postoperative period, the quality of life of patients significantly improves; they become more mobile and stable in their walking and report reduced pain, consequently reducing the consumption of analgesics and preventing further deformity development. In the process of treatment and care for the patient, the nurse's role is essential.

326 HEALTH CARE FOR PATIENTS WITH INJURIES AND THEIR CONSEQUENCES CERVICAL SPINE DISC HERNIATION

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Torsion injuries of the cervical spine (distention of the cervical spine and paravertebral musculature), and the resulting disc herniation that requires neurosurgical treatment, is an increasingly common disease of middle-aged people and the younger population. more frequent cause of disability.

The progress recorded in the care and neurosurgical treatment of such injuries, in addition to prolonging life and reducing complications, also set new demands for society as a whole; and posed a great challenge to the nurse in the health care of patients with cervical spine injuries.

In this paper, we will present the postoperative care of patients after anterior cervical discectomy with intracorporeal fusion (ACDF -Anteriorcervicaldiscectomyandfusion).

327 NURSING INTERVENTIONS IN PATIENTS WITH SPINE STABILIZATION

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Diseases of the lumbosacral part of the spinal column are numerous and generally begin as pain in the lower back that can spread to the leg (lumbar syndrome, lumboischialgia, sciatica). The most common pathological changes that exert pressure on nerve structures occur as a result of degeneration within the spinal column (degeneration of discs, vertebrae, joints, ligaments, ...).

Operative treatment: Operative treatment stabilizes the spine and removes pressure on nerve structures. This reduces pain and prevents further deterioration of nerve structures. However, problems due to already caused damage to the nervous structure, as well as associated diseases, may remain. They include pain that is not caused by pressure on the nerve root or instability.

Treatment after surgery: Operative treatment of the spine is always only part of the therapy. Before, and especially after surgery, other methods of treatment are needed. Symptomatic and supportive therapy, as well as physical treatment and changing the patient's habits, are dominant. Symptomatic therapy is usually therapy against pain and inflammation (antirheumatic drugs, non-steroidal analgesics - Movalis, Nimulid, Diclofenac, ...), and against muscle spasms (Benzodiazepam, Tetrazepam, ...).

Post-operative treatment begins the moment the patient is transferred from the intensive care unit to the pin. Permanent 24-hour monitoring, control of the operative field, pressure control, sharing of therapy and other procedures in the application of health care.

The nurse actively participates in all segments of work and is an active collaborator in her multidisciplinary team. In addition to doctors and nurses, they also include physiotherapists who are an indispensable link in the chain, for faster and better recovery of patients and their return to their environment and return to regular activities with minimal restrictions.

328 HEALTH CARE OF PATIENTS AFTER STABILIZATION OF THE SPINE

Tea Šebek

Summary: Spine is a part of the axial skeleton built of vertebrae that are interconnected by joints and ligaments. The action of physical force on the human body can lead to injury to the spine and spinal cord. Injuries occur when there is damage to the bone part of the vertebrae, ligaments, or intervertebral discs. If it is a larger force, damage to the spinal cord and blood vessels can also occur.

Degenerative diseases of the spine occur because of many years of exposure of the spine to various efforts and microtraumas, here we include heavy physical work, long sitting, long rides in the car etc.

Treatment of traumatic or degenerative diseases of the spina can be conservative or surgical. Recognizing the clinical picture and neurological deficit and treating them on time is of the main factors and predictors of patient recovery.

Health care is divided into preoperativne, perioperative and postoperative. Nurse is a key part of multidisciplinary team in health care of patients.

Keywords: spine, degenerative diseases of spine, nurse, health care, spondylodesis

329 PREOPERATIVE AND IMMEDIATE POSTOPERATIVE CARE OF PATIENTS OPERATED FOR HERNIATED DISC

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Introduction: Approximately 80% of patients with a herniated disc can be successfully treated conservatively without complications, and surgery is not required. Pain relievers, muscle relaxants, physical therapy, as well as occasional manual-medical treatments or acupuncture are used. Prolonged bed rest negatively affects the healing process because it leads to the weakening of the muscles that support the spinal column. If there is no weakness, conservative treatment is recommended for at least one month, and in case of no improvement, surgery could be recommended. In emergency settings, when acute signs of weakness or paralysis and intolerable pain that cannot be alleviated with medication occur, immediate surgery is also an option.

Many patients have questions directed at nurses, so it is essential for them to be informed about the treatment process, especially about the preoperative and postoperative procedures.

The aim of this study was to adapt the role of the nurse and the procedures for such patients in accordance with current recommendations and to systematize them for the improvement of care immediately after surgery.

Methods: Based on institutional experience and a review of the literature, key information that nurses need to have when working with patients undergoing herniated disc surgery was identified.

Results: Patients are usually admitted to the hospital one day before surgery, during which they should be prepared for general anesthesia, pain relief, and alleviation of irrational fears.

After surgery, in addition to assisting with getting out of bed and taking the first steps, it is necessary to guide the patient in further actions, including protective movements, and to educate them about daily activities. Additional questions about returning to work, engaging in sports, driving a car, and similar concerns often arise, and prepared answers are also required for these inquiries.

It is essential to emphasize that patients should avoid prolonged sitting and heavy lifting, and they need to receive clear instructions from the medical staff for their actions after discharge.

Conclusion: The role of the nurse in preoperative and immediate postoperative care is of paramount importance, and standardized procedures and recommendations lead to the highest level and quality of care for this very demanding group of patients.

330 QUALITY OF LIFE OF PATIENTS AFTER DISC HERNIATION SURGERY

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Introduction: Disc herniation, intervertebral disc prolapse, disc extrusion, is a spinal disease of the intervertebral disc of the spinal column, which occurs as a result of prolapse(herniation) and the penetration of the gelatinous core of the intervertebral disc into the intervertebral openings, where it exerts pressure on the roots of the spinal nerves, and sometimes in the central the spinal canal and the space that houses the spinal cord and the cauda equina which it also compresses. Disc herniation is usually treated conservatively first. However, if conservative therapy does not give results, surgical intervention is used. Preoperative treatment is usually long-term and patients are exposed to unpleasant, chronic pain.

Objective: To present the quality of life of patients after disc herniation surgery.

Discussion: The postoperative course is emotionally disturbing, accompanied by uncertainty, anxiety, fear of repeating the entire process. Most patients, regardless of individual differences, show similar psychological reactions during the course of the disease, treatment and rehabilitation, which is further projected to reduce the quality of life after surgery. Namely, several publications suggest that the majority of patients who underwent surgery for disc herniation felt an improved quality of life within one year after surgery, which is directly correlated with the status of patients in the postoperative course and rehabilitation process.

Conclusion: In order to increase the quality of life of patients after disc herniation surgery, it is necessary to work significantly on educating patients about risk factors that have a direct impact on the postoperative reduction of quality of life.

Keywords: quality of life, disc herniation, neurosurgery

331 CRUCIAL ROLE OF THE SURGICAL NURSES IN MONITORING POSTOPERATIVE PERIPHERAL NERVE STATUS AND SYMPTOMS FOR PATIENTRECOVERYANDOUTCOMES IN COMPRESSIVE NEUROPATHIES

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The monitoring of immediate postoperative peripheral nerve status and symptom severity by surgical nurses is a crucial component of patient care in the context of compressive neuropathies. Surgical nurses play a vital role in closely observing and evaluating changes in neurological function and symptom severity during the early stages of recovery.

Through their observations, surgical nurses play a crucial role in: Early Identification of Complications: By closely monitoring peripheral nerve status and symptom severity, surgical nurses can promptly detect complications such as nerve injury, infection, or recurrent compression. Early identification enables timely intervention and management, minimizing the impact of complications on patient recovery.

Timely Intervention: Surgical nurses' ability to recognize changes in neurological function and symptom severity allows for timely intervention and adjustment of the treatment plan. By collaborating with the healthcare team, they facilitate informed decision-making and ensure appropriate actions are taken promptly to address complications or emerging issues.

Patient-Centered Care: By closely monitoring symptoms and assessing their impact on patients' daily lives, surgical nurses provide patient-centered care. They actively involve patients in their own recovery process, addressing their concerns, and adapting care plans to meet individual needs.

Optimal Recovery and Improved Outcomes: The vigilant monitoring performed by surgical nurses supports optimal patient recovery by ensuring that potential complications or issues are addressed early. Through their diligent observations and interventions, surgical nurses contribute to improved patient outcomes and enhanced quality of life.

Conclusion: Through their diligent assessments, observations, and interventions, surgical nurses play a significant role in early identification of complications, timely intervention, and patient-centered care. Their contributions ultimately support optimal recovery and improved outcomes for patients undergoing surgical procedures for compressive neuropathies.

Keywords: Nurses; postoperative; peripheral nerve; neuropathies.

332 AVOIDING PERIPHERAL NERVE INJURY DURING VENIPUNCTURE

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Venipuncture is an essential and frequently performed procedure in healthcare. While venipuncture is generally safe, there is a potential risk of peripheral nerve injury. Avoiding this injury is critical for ensuring patient safety and preventing complications.

Peripheral nerve injury during venipuncture can lead to symptoms such as sharp pain, numbness, and tingling. In severe cases, it may result in loss of function and long-term damage. This underscores the importance of preventing these injuries. To avoid peripheral nerve injury, nurses should employ a combination of proper training, technique, patient assessment, and communication.

Firstly, understanding of anatomy is crucial. Before performing venipuncture, nurses must be familiar with the locations of peripheral nerves relative to veins. The antecubital fossa is a common site for venipuncture, but the proximity of the median nerve makes it imperative to have a clear understanding of anatomical landmarks.

Secondly, the technique used during venipuncture plays a pivotal role in avoiding nerve injury. It is essential to choose the correct needle size and type. A smaller gauge needle is generally preferable as it is less likely to cause significant nerve damage. Moreover, the needle should be inserted at the correct angle and depth. Stabilizing the limb and applying a tourniquet can also make veins more visible and accessible, reducing the likelihood of inadvertently puncturing a nerve.

Thirdly, patient assessment and communication are paramount. Patients should be asked to report any sharp, shooting pain or abnormal sensations immediately. This open communication can allow for quick adjustment or cessation of the procedure if necessary.

In conclusion, avoiding peripheral nerve injury during venipuncture is fundamental for ensuring patient safety and comfort. Through a comprehensive understanding of anatomy, the application of proper techniques, and effective patient assessment and communicatinurseshealthcare professionals can minimize the risk of nerve injury. As venipuncture remains an essential procedure in healthcare, prioritizing these skills is key to for maintaining the highest standards of patient care.

Keywords: Nurses; peripheral nerve; venipuncture; injury

333 GUARDIANS OF PRECISION: THE PIVOTAL ROLE OF SCRUB NURSES IN MICROSURGICAL PERIPHERAL NERVE RECONSTRUCTIONS

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Peripheral nerve reconstruction surgery involves extremely precision's procedures. A scrub nurse's role in these microsurgical operations is important.

First, the scrub nurse is responsible for maintaining a sterile environment. The implications of contamination in peripheral nerve reconstruction are appalling. The introduction of foreign particles or bacteria can compromise nerve grafts, impede the regeneration process, or cause infections. The scrub nurse ensures that all instruments are sterilized and handled appropriately, which is vital for the patient's recovery and overall health.

Moreover, the scrub nurse has an in-depth understanding of the microsurgical instruments, such as micro-scissors, forceps, and needle holders, required for the procedure. They must anticipate the surgeon's needs, ensuring that the right instruments are available at the right moment. This requires not just knowledge but also dexterity, as handing over these delicate tools requires precision to avoid any unintended movements that might compromise the surgery.

In addition, scrub nurses must be familiar with the surgical procedure's specifics and anticipate the sequence of events. Their alertness is crucial in situations where a rapid response is required to prevent complications.

Furthermore, the scrub nurse acts as the surgeon's auxiliary eyes and hands. In such a high- magnification field, the surgeon might have a limited view. The scrub nurse keeps track of the broader picture, monitoring the patient's status and providing additional visual or tactile information to the surgeon.

In conclusion, the role of the scrub nurse in microsurgical operations for peripheral nerve reconstructions is a blend of vigilance, precision, and adaptability. Through maintaining sterility, managing instruments, and being an auxiliary observer and assistant, the scrub nurse is essential in ensuring the success and safety of these delicate procedures.

Keywords: Scrub nurse; Microsurgery; Peripheral Nerve; surgery.

334 PROTOCOL FOR INVASIVE MEASUREMENT OF INTRACRANIAL PRESSURE

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Intracranial pressure (ICP) refers to the pressure exerted by cerebrospinal fluid within the cranial cavity on brain tissue.

It is measured in mm Hg and normal values range from 0 to 20 mm Hg. One of the most common causes of elevated ICP is brain or cranial trauma. In the operating room, a protocol is followed for the procedure of measuring intracranial pressure, involving 2-3 surgical instrument nurses. They prepare all necessary equipment, including basic and specialized instruments, as well as disposables and implants. Following surgical handwashing, the instrument nurse enters the operating room, dons sterile attire and gloves, and proceeds to set up the surgical tables. Meanwhile, the circulating nurse opens all required items. Once the surgeons have also completed their handwashing and are attired in sterile garb, they proceed to isolate the operative field, which was previously prepared. With the operative field ready, the necessary equipment is connected, and the procedure begins. An incision is made through the skin and subcutaneous tissues, followed by the creation of a cranial and dural opening. Subsequently, a catheter for invasive intracranial pressure measurement is inserted. The measurement device is calibrated, connected to the catheter, and intracranial pressure can be monitored.

Proficiency in the protocol for the operative technique of intracranial pressure measurement is crucial for the instrument nurse to ensure the smooth execution of the procedure.

335 GLIOMS OF THE BRAIN - THE SCOPE OF THE NURSE'S WORK

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Tumors arise from congenital malformations where, due to developmental abnormalities, the conditions for neuroplastic tissue growth are realized, when there is genetic determination of neoplastic growth, exposure to radiation can be the initial factor of brain tumor growth, as well as trauma and infections. Genes that play a role in the development of brain tumors, as well as in the case of malignancy in general, can be classified as tumor suppressor genes and proto- oncogenes. The most common symptoms of brain tumors are: headache, dizziness, nausea, vomiting, epileptic seizures, visual disturbances.

Gliomas are primary tumors arising from the brain parenchyma. Division of gliomas (Astrocytomas, Glioblastomas, Oligodendrogliomas, Medulloblastomas, Ependymomas)

If a neurological examination suspects a pathological process in the head, it is necessary for the patient to undergo imaging, ie a scanner or magnetic resonance imaging. Treatment of brain tumors usually consists of radical removal and chemotherapy. If a neurological examination suspects a pathological process in the head, it is necessary for the patient to undergo imaging, ie a scanner or magnetic resonance imaging. Treatment of brain tumors usually consists of radical removal and chemotherapy.

After brain tumor surgery, the patient is placed in the intensive care unit where he usually stays for 48-72 hours. This period is crucial for the patient's recovery. The purpose of postoperative health care is to satisfy the basic needs of the patient, through nursing diagnoses and prevention of possible nursing medical problems that occur during that period.

Therefore, it is very important to assess the patient's condition and come to a conclusion about the existence of a problem. The most common post-operative nursing problems are: pain, reduced possibility of self-care, reduced airway patency, reduced effort tolerance, damage to the oral cavity, constipation.

Among nursing medical diagnoses, there are: high risk for bleeding, high risk for infection, high risk for deep vein thrombosis. The nurse-technician must monitor the patient's vital functions, state of consciousness, monitor drains and diuresis and record everything in the nursing documentation.

The nurse also takes care of the patient's diet, therapy and helps with personal hygiene. It is necessary to give the patient positive verbal information about achievements and any progress, as this will reduce feelings of helplessness and anxiety. The psychological support of the nurse is very important for the patient to accept the new condition, which may be temporary or permanent.

336 VAGUS NERVE STIMULATION (VNS) - ROLES AND RESPONSIBILITIES OF THE NURSE

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Introduction: Vagus nerve stimulation (VNS) is a type of epilepsy treatment. A vagus nerve stimulator is a device used to treat seizures when seizure medications are not effective and open surgery is not possible. Epilepsy nurses are part of the neurosurgical team with a vital role in preoperative, intraoperative and immediate post-operative procedures.

Materials and methods: The operation is performed under strictly sterile conditions. The two components of the system (generator and electrode) are surgically implemented in a procedure performed under general anesthesia. The left side of the neck and chest are prepared and draped. A transverse skin incision of 3-4 cm is made in the skin fold of the left neck in order to obtain a good aesthetic result. The incision is made halfway between the mastoid and clavicle and extends from the midline to the medial border of the sternocleidomastoid muscle.

The vagus nerve is usually located between the common carotid artery and the internal jugular vein. Stimulator energy is set by passing the pocket tunnelizer to the cervical incision. Surgical wounds are closed in anatomical layers using absorbable sutures. The operation lasts between 1 and 2 hours.

Results: VNS produced an average attack rate reduction of 50% at 12 months. 1 in 10 patients get rid of the attack. Optimal effectiveness of VNS is usually achieved approximately 4-8 months after surgical treatment. 8 out of 10 people who received VNS reported an improved quality of life. Surgical complications with implemented VNS are rare. These include: pain at the site where the incision was made to implant the device, infection, difficulty swallowing and paralysis of the vocal cords, which is usually temporary.

Conclusion: About one-third of people with epilepsy do not respond adequately to anti-seizure medications. Vagus nerve stimulation is performed to treat seizures that are controlled by medication. The minimally invasive technique involves implanting an electrical device that when activated sends electrical signals along the left vagus nerve to the brainstem, which then sends signals to a specific area of the brain. Benefits of VNS may include fewer seizures, fewer severe seizures or shorter seizures, fewer epilepsy medications, and improved quality of life.

Keywords: VNS vagus nerve stimulation, refractory epilepsy, epilepsy clearance nurse

337 CHRONIC SUBDURAL HEMATOMA AS A CHALLENGE IN THE NEUROSURGICAL PATIENTS CARE

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Introduction: Chronic subdural hematoma (CSDH) primarily affects elderly individuals. Age- related brain atrophy reduces brain volume, expands the subdural space, and provides a foundation for the accumulation of CSDH without an increase in intracranial pressure. Consequently, symptoms develop gradually as the subdural collection grows.

Surgery is indicated for all patients with symptomatic CSDH, and the most common procedure is a burr-hole craniostomy with drainage. The surgery itself is one of the most successful procedures in neurosurgery, but patients are often vulnerable, and adequate postoperative care is crucial. The aim of this study was to systematize the role of the nurse and the procedures for such patients in accordance with current recommendations.

Methodology: Based on institutional experience and a review of the literature, nursing procedures relevant to the outcome of patients with CSDH were identified.

Results: Preoperatively, it is essential to provide an introduction to the patient's condition because reporting on it in the immediate postoperative period is significant for the prevention of complications and lasting consequences. Cardiological comorbidity is often present, requiring basic monitoring, and for those receiving anticoagulants, it is desirable to normalize these parameters before surgery.

The surgery is often performed under local anesthesia, so although there is no pain, many patients may develop anxiety or even initial delirium, which requires the use of anxiolytics or antipsychotic drugs, requiring additional engagement.

The positioning during drainage is controversial. Forced supine positioning was often used to promote drainage and brain re-expansion, but this approach frequently leads to complications such as pneumonia, deep venous thrombosis, aspiration, and compromises outcomes in older patients. In our institution, the practice is to mobilize patients as soon as possible and have them assume an active posture in bed, with drains being closed before sitting or standing.

The patients' condition and drainage are constantly monitored, and any sudden change in the patient's condition or a change in the color and quantity of drained contents necessitates consultation with a physician.

Conclusion: The role of the nurse in preoperative and immediate postoperative care is of greatest importance, as improper manipulation of drains can have lethal consequences, regardless of the initial positive response to the surgery itself.

338 HEALTH CARE OF PATIENTS AFTER SKULL BASE OPERATION

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Introduction: The base of the skull is the area of the skull that protects the brain from mechanical injuries. This area contains complex and intricate anatomy, including blood vessels that provide essential nutrients, nerve pathways, and many other important functional structures. The base of the skull is divided into front, middle and back. Tumors and other disorders can occur in any of these regions, interfering with their normal function. Depending on the tumor's location, size, and type, the structures involved may be very limited, or may include the floor of the brain, nasal cavity and sinuses, orbits (eyes), ears, throat, and neck, as well as the nerves and blood vessels that support those structures.

Objective: To show the specifics of postoperative health care for patients after skull base surgery.

Discussion: Postoperative health care of patients after skull base surgery requires specific neuroscience knowledge from nurses, especially considering that the list of potential postoperative complications after skull base surgery is very extensive. Postoperative care of these patients requires monitoring of neurological and respiratory status, postoperative monitoring of the wound, establishment of communication and assessment of the patient's psychological status.

Conclusion: Providing adequate health care to patients after skull base surgery requires a multidisciplinary approach and the cooperation of all team members involved in the treatment and care of these patients in order to meet their specific needs.

Keywords: neurosurgery, skull base surgery, postoperative care, health care

339 ENDOSCOPY THIRD VENTRICULOCISTERNOSTOMY PREPARATION AND INSTRUMENTATION

Ivana Strbac

The goal of ETV is to move towards minimally invasive methods. In modern neurosurgery, the endoscope plays a very important role. Today, ETV is the standard in the treatment of obstructive hydrocephalus.

Ventriculocisternostomy is performed with the help of an endoscope by blunt perforation of the bottom of the third ventricle and expansion of the ventriculocisternostomy using a Fogarty catheter.

The role of the instrument technician is to prepare instruments and sterile material. She participates in the preparation of the operating field by covering the patient sterilely. takes care of the wound.

340 EPILEPSY

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Introduction: Epilepsy is common condition known from ancient times. The word epilepsy comes from Ancient Greek word epilēpsia and means – to seize, to possess or afflict. It is the most frequent, chronic, neurological disease that affects people of all races, ethnic backround and can start at any age. However, majority of patients have first seizure in first or second decade of life. It is estimated that around 50 milion people worldwide have epilepsy. The underlying mechanism of an epileptic seizure is excessive and abnormal neuronal acitvity in the cortex of the brain.

Types of epileptic seizures

1. Generalized (absence, atonic seizures, tonic-clonic seizures, tonic and myoclonic seizures),
2. Focal,
3. Non-epileptic seizures,
4. Status Epilepticus.

Risk factors: Genetics, Brain injures, Brain tumors, Stroke, Alzheimer's disease, Infections (meningitis, encephalitis, AIDS), Poisoining, Alcohol and drug, Methabolic and other genetic diseases.

Diagnosis: Blood sample, Urin sample, Liquor sample, EEG, EEG after sleep deprivation, CT (Scan) of the brain, MRI (magnetic resonance imaging) of the brain, Psyhological testing and assessment.

Treatment: AEDs (antiepileptic medications), Diet Therapy, Surgery, "Avoidance therapy". Conclusion: People with epilepsy are more likely to have psyhological problems such as depression, anxity and suicidal thoughts. We, as health workers should constantly educate ourselves and work on raise of awareness and self-confidence among people with epilepsy. In addition to that, it is extremely important to work on raise of awareness among healthy people and relatives who are integral part of life of our patients with epilepsy.

341 FATAL ANEURYSM - FAMILY SUPPORT (CASE STUDY)

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Introduction: An aneurysm is a localized expansion of blood vessel filled with a blood that most often occurs as a result of disease and weakening of blood vessels, whereby they become more elastic and thinner.

Goal: Living in this time is full of stressful situations, and various disease for witch there is less and less time for examination and prevention. If we do not help ourselves, we will not be able to help others either. Save your life.

Method of work: Case study. Reanimation of a vitally endangerd patient due to aortic rupture in the filed in unfavorable conditions.

Familly support: A period of stress, pain and grief is inevitable. Time is a link that will lead the members of the close family to facilitate their own future in an adaptive way by accepting and remembering through gratitude for the lost of the beloved member.

Keywords: Aneurysm, symptom, pain, blood, death, stress, sadness.

342 THE SCOPE OF THE NURSE'S WORK WITH PATIENTS WITH AN INDICATION FOR BACLOFEN PUMP

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Baclofen is a derivative of gamma-aminobutyric acid (GABA). It is primarily used to treat spasticity. In some patients, severe spasticity, of cerebral or spinal origin, cannot be successfully treated with conventional, oral medications or physical therapy. Intrathecal baclofen therapy with an implanted pump has been an effective treatment since the mid-1980s.

Clinical use of Baclofen is indicated for the symptomatic treatment of spasticity of cerebral origin, especially if it is caused by cerebral palsy, but also after cerebrovascular injuries or in the presence of neoplastic or degenerative brain diseases.

Indications for the use of Baclofen are: paraplegia, injuries after a traffic accident, children with cerebral palsy. Indications for the use of Baclofen are: paraplegia, injuries after a traffic accident, children with cerebral palsy.

After receiving the patient, the data with the referral diagnosis are recorded. Blood is taken for blood group analysis, lungs and spine are scanned in two directions.

The condition of these patients is difficult and these are difficult psychological moments for them. The nurse actively participates in all procedures that are planned and implemented. Testing is performed - a lumbar puncture is performed, Baclofen ampoules are given in certain doses. When it comes to children, the approach is a little different.

To carry out health-educational work with patients and to point out to them the significance of the application of therapy (when it is a child, parent education). In addition to doctors and nurses, physiotherapists are also involved, who are an important link in the treatment process until the end of the treatment and the return of the patient to his environment and activities that have been temporarily suspended due to illness.

Keywords: Spasm, baclofen pump, antispasmodic application, nurse

343 STANDARDIZED HEALTH CARE PROCEDURES IN CHILDREN WITH INTRACRANIAL BLEEDING

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Intracranial bleeding is a serious condition that requires prompt and effective intervention to prevent complications and improve treatment outcomes. The proposed therapeutic guidelines have the potential to improve the quality of health care provided to children with intracranial hemorrhage, but also reduce the risk of unwanted complications.

The authors discuss key components of standardized procedures, including diagnosis, monitoring, treatment, and standardized pediatric care activities, and emphasize the importance of interdisciplinary collaboration and communication in achieving optimal treatment for this group of pediatric patients.

As part of the paper, a very complex case of a patient with an aneurysm of the vein of Galen is presented and diagnostic and treatment modalities are considered, as well as clinical variables that influence the outcome.

Keywords: pediatric care, health-educational work

344 HEALTH CARE OF PATIENTS WITH CLOSED CRANIOCEREBRAL BRAIN INJURY

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Craniocerebral injuries or neurotraumas are injuries to the skull and brain that cause temporary or permanent damage to brain function. Traffic accidents are considered the leading cause of craniocerebral brain injuries along with falls, sports injuries and gunshot injuries. They are among the leading causes of death, more often in the younger population.

Craniocerebral injuries are divided into open and closed. Concussion, brain contusion, intracranial bleeding (epidural, subdural and intracerebral) are classified as closed craniocerebral injuries in which there is no break in the continuity of the skin, while in open injuries there is damage and break in the continuity of the skin, and they can affect the soft parts of the head, bones of the skull , meninges and brain mass.

Early diagnosis, selection of appropriate treatment, and easier and shorter recovery have been greatly facilitated thanks to the development of diagnostic procedures.

The aim of the care of the neurosurgical patient is to provide quality health care that is aimed at alleviating, solving problems and making recovery as easy as possible and returning to everyday life as a productive and independent individual as quickly as possible.

The nurse/technician plans and implements patient health care. It requires an individual approach, a good relationship between the health team, the patient and the family, as well as trust, observation and empathy. Good education about craniocerebral conditions is an important factor because the nurse/technician is the person who spends the most time with the patient and is the first to notice any change, and further informs the health care team.

The health care of patients with closed craniocerebral injuries is extremely complex, because most such patients come with other serious injuries and require highly specialized knowledge and skills of nurses/technicians. Care of the patient begins immediately after the patient enters the hospital, where the nurse/technician performs physical preparation, monitors vital functions and observes the state of consciousness. In addition to all physical preparation, mental preparation is also important, in which the nurse/technician must be patient, confident in what they are doing and have a positive attitude.

Keywords: craniocerebral injuries, nurse/technician, multidisciplinary approach, health care

345 MEDICAL CARE OF PATIENTS WITH CEREBRAL ANEURYSM - CASE REPORT

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Through the paper, we will present the case of a patient with a cerebral aneurysm who was admitted to the Department of Neurosurgery due to its operation. Taking a nursing history, nursing documentation, preoperative preparation of the patient, semi-intensive care of the patient and rehabilitation after hospital treatment are just some of the items that we will explain in more detail throughout the paper. Neurosurgical nursing at SKB Mostar includes daily tasks that include pain management, wound care, patient and family education, knowledge of diagnostics, documentation, assessment of patient care, research and interdisciplinary teamwork.

346 RADIOSURGERY – GAMMA KNIFE

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Due to its precision and documented results, the gamma knife is used in all leading medical institutions around the world as a non-invasive stereotaxic instrument, which does not involve surgery and which achieves results without damaging the surrounding healthy tissue. Due to the already mentioned reason, but also the fact that the treatment is carried out in just one day, after which the patients who underwent the intervention leave the hospital and return to their daily lives. daily activities Gamma knife stereotaxic radiosurgery is today accepted as the gold standard.

The concept was developed in 1951 by the Swedish neurosurgeon Lars Leksel, his idea of conducting navigation within a three-dimensional field was an excellent basis for the later creation of the Gamma Knife in 1968. This non-invasive treatment uses a stereotaxic frame on the head as an external reference while navigation within the field involves the process of directing individual beams of gamma rays.

The device emits about 200 beams of gamma rays created by the decay of radioactive cobalt, which are directed precisely and focused only on the marked target inside the endocranium, without damaging healthy tissue along the way. The radiation inside the change causes the breaking of DNA chains, which makes it impossible to further feed the change itself, which leads to the stopping of its growth and, over time, to its complete disappearance.

The largest number of patients who were treated with the Gamma Knife are those who have metastases in the endocranium from the primary site of the tumor (mainly from the lungs, kidneys, breast...), but the indications for the treatment are also benign changes (schwannomas, meningiomas), trigeminal neuralgia, arteriovenous malformations. A special benefit is reflected in the fact that even those changes that are inoperable either because of their location, size or simply because of the general condition of the patient can be treated.

In Serbia, the Gamma Knife began operating in November 2018, since then over 5, 500 patients with various endocranial changes have been irradiated using the device. Each employee in our center performs an important independent function, but it is realized through interdependent functions with other members of the multidisciplinary team. Our team consists of neurosurgeons, radiation oncologists, radiotherapy technicians, nurses and physicists.

We holistically approach the patient and his family through the process of treatment and health education. The advantage of the existence of such a device in Serbia is the provision of the possibility of treatment such as is carried out in the world's health centers, while not separating it from everyday life. Employees are continuously renewing their knowledge and adopting new ones, following all the innovations and protocols that appear in the field of radiosurgery.

Keywords: radiosurgery, gamma knife, multidisciplinary team

347 THE SCOPE OF THE NURSE'S WORK AT THE GAMA KNIFE DEPARTMENT

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The gamma knife is a device that precisely affects the target by focusing high-dose radiation (Co 60) from 192 sources. The gamma knife method is performed without an operative cut on the head. Indications for the gamma knife are benign and malignant tumors up to 3 cm, arteriovenous malformation, trigeminal neuralgia.

The nurse participates in the preparation for the performance of the intervention, assists in the performance of the intervention, and takes care of the patient after the treatment is completed. It carries out medical-technical operations, but also carries out health-education of both the patient himself and his family. Preparation for the implementation of the intervention includes preparation of the patient, laboratory analysis, medication preparation, physical and immediate. Performing the intervention involves setting up a stereotaxic frame, measuring the dimensions of the skull, imaging, planning radiation therapy, and air treatment. At the end of the treatment, the nurse participates in removing the frame from the head and giving one-time therapy. After the patient is discharged, the nurse prepares the used material and sends it for sterilization.

Gamma knife treatment is carried out multidisciplinary, as a team, in addition to medical physicists, doctors and radiology technicians, and nurses play an equally important role.

Keywords: nurse, gamma knife, stereotaxic radiosurgery

348 SPECIFICITY OF HEALTHCARE IN PATIENTS UNDERGROUND DUE TO INTRACRANIAL BLEEDING

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Introduction: Intracranial bleeding is defined as bleeding inside the skull, of various etiologies, it is the biggest cause of mortality and morbidity, it can cause various complications.

Objective: specificities of health care in patients operated on due to intracranial bleeding.

Discussion: the goal of the nurse in the care of such patients is to ensure a patent airway, measure vital signs, monitor general and specific signs of inflammation, prevent the occurrence of secondary infections, monitor diuresis, meningeal signs, monitor TA, continuous monitoring, provide psychological and emotional support to the patient . The goal of caring for neurosurgical patients is to provide quality health care that is aimed at helping the patient return to everyday life as much as possible as a productive and independent individual.

Conclusion: Intracranial hemorrhages are severe hemorrhages that can cause serious consequences if they are not repaired in time and if adequate therapy, appropriate nursing care, and patient education are not applied.

Keywords: intracranial bleeding, health care, nurse technician

349 THE ROLE OF THE NURSE IN THE TREATMENT OF PATIENTS AFTER PITUITARY TUMOR SURGERY

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The pituitary gland is a small endocrine gland at the base of the brain, in a bony depression called the sella turcica. It is divided into three parts, each of which secretes different types of hormones that control the work of most other glands in our body, and the tumors that appear in it are mostly benign. Pituitary tumors are diagnosed with MR or CT of the endocranium. Symptoms that can occur are headache, vision problems, acromegaly, lack of milk in nursing mothers and many others. Due to the unique location of the pituitary gland inside the skull, there are two ways in which the surgical procedure can be performed, namely the transphenoidal and craniotomy approach.

The role of the nurse before/during/after the operative care of a patient diagnosed with a pituitary tumor is complex and requires a comprehensive holistic approach to the patient and his family. Through the health care process, it performs an independent function, but it is realized through interdependent functions of the function with members of the multidisciplinary team (neurosurgeons, endocrinologists, physiotherapists, anesthesiologists).

The nurse is most often the first contact for the patient, but also a person who is very involved and present throughout the entire treatment process from the first examination, participation in diagnostics, preoperative preparation, during surgery and in the post-operative period (recovery). Through health education, she is present during the entire treatment process, but also after discharge from hospital treatment during follow-up visits.

Pituitary adenomas are most often treated surgically at the department of neuro-oncology at the UKCS. After standard procedures, preparation for operative treatment, the patient is placed in the intensive care unit until fully awake. After that, the patient is transferred to ward treatment, where it is necessary to provide him with absolutely continuous care and monitoring.

This is reflected in the implementation of many medical-technical procedures, laboratory analyses, monitoring of excretions, monitoring of vital parameters, implementation of care and nutrition, as well as the organization of diagnostic procedures as needed. Nurses in working with patients showed exceptional knowledge, which was contributed by continuous education, many expert meetings and seminars where nurses exchange their knowledge and experiences and later implement them in the process of working in their department.

Keywords: nurse, pituitary surgery, health care, health education

350 CARE OF NEUROSURGICAL PATIENTS WITH CRANIOCEREBRAL INJURIES IN THE INTENSIVE CARE UNIT

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Craniocerebral injuries include head and brain injuries, but it can be said that they are rare conditions in which this organ is isolated. A particularly vulnerable group of people are neurosurgical patients with quantitative disorders of consciousness. Such patients are deficient in all aspects of basic life needs and therefore require continuous health care. Usually, trauma in neurosurgery, in addition to injuries to the brain tissue, includes injuries to the bones of the skull, soft tissues of the face, injuries to the orbit, eye, maxillofacial injuries, as well as injuries to the hearing apparatus. Injuries occur through different mechanisms, falls, fights, and very often in traffic accidents.

We can divide these injuries into open and closed. Some of the most common injuries are: concussion, subdural hematoma, epidural hematoma, traumatic intracerebral hemorrhage.

What is very important in these patients is the prevention of additional brain tissue damage. Upon receiving the patient, the nurse assesses his state of consciousness and implements interventions according to priorities.

Duties of a nurse are: places the patient in an adequate position in bed, assesses the state of consciousness, monitors and records vital parameters in the medical documentation, pays special attention to arterial blood pressure, breathing, condition of the pupils, observes the size, appearance and reaction of the pupils to light, and observes the appearance of possible epi attacks. Conducts an observation of the entire body because there is a possibility of combined injuries of other organs and organ systems. Samples blood for various laboratory analyses. Performs aspiration of the tracheobronchial tree, places a nasogastric tube, applies adequate therapy prescribed by the doctor, places a urinary catheter and measures and records the amount of urine. Open head injuries are treated. If additional diagnostics are planned, the nurse prepares the patient for the same. The nurse is also in charge of the preoperative preparation of the patient. It is possible to have licorice as well as bleeding from the nose, mouth or ears. Monoparesis and hemiparesis, which can later turn into hemiplegia, are also very common.

It is of great importance to establish the circumstances of the injury, that is, to establish how the injury occurred, because with this we can predict possible associated injuries. A large number of these patients are unconscious, and the data on the injury are obtained heteroanamnestically. It is correct to say that there is no harmless craniocerebral injury and detailed observation of each patient is necessary.