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PROCEEDINGS  
МАТЕРИАЛЫ



# 3<sup>RD</sup> CONGRESS OF EURASIAN ASSOCIATION OF PEDIATRIC NEUROSURGEONS (EAPN)

MAY 31-JUNE 3 | YEREVAN, ARMENIA



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III СЪЕЗД ЕВРАЗИЙСКОГО СООБЩЕСТВА  
ДЕТСКИХ НЕЙРОХИРУРГОВ

МАЙ 31-ИЮНЬ 3  
ЕРЕВАН, АРМЕНИЯ





EAPN



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of the Republic of Armenia



PROCEEDINGS  
3<sup>RD</sup> CONGRESS  
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## Dear Esteemed Colleagues,

It is with great honor and heartfelt enthusiasm that I welcome you to the 3rd Congress of Eurasian Association of Pediatric Neurosurgeons, taking place in the historic and vibrant city of Yerevan, Armenia.

This congress brings together leading pediatric neurosurgeons, clinicians, researchers, and allied professionals from across Europe, Asia, and beyond, united by a shared commitment to advancing the care of children with neurosurgical disorders. This Congress stands as a bridge between regions, generations, and ideas, fostering collaboration that transcends borders and strengthens our global professional community.

Building upon the strong foundations laid by previous congresses, this third congress aspires to inspire excellence, encourage innovation, and ignite meaningful dialogue. Through high-level scientific sessions, cutting-edge research presentations, and interactive discussions, we will explore both the challenges we face today and the possibilities that lie ahead in pediatric neurosurgery. Together, we will reaffirm our commitment to advancing knowledge, improving outcomes, and shaping the future of care for children worldwide.

Yerevan, one of the world's oldest continuously inhabited cities, offers a setting rich in history, resilience, and warm hospitality. Its spirit mirrors the values of our profession: endurance, dedication, and hope. We warmly invite you to experience Armenia's culture, hospitality, and traditions, and to form friendships and collaborations that will endure long after the congress concludes.

May this congress inspire new ideas, strengthen professional bonds, and remind us all why we chose this noble path of service. I look forward to welcoming you personally to Yerevan for what promises to be an enriching, meaningful, and memorable event.

With my warmest regards and best wishes,

*Samvel Sargsyan, MD*

*President, Armenian Society for Pediatric Neurosurgery (ASPN)*

## Уважаемые Коллеги!

С большой честью и искренним энтузиазмом приветствую Вас на III Съезде Евразийского сообщества детских нейрохирургов, который проходит в историческом и оживлённом городе Ереване, Армения.

Этот съезд объединяет ведущих детских нейрохирургов, врачей, исследователей и специалистов смежных областей из Европы, Азии и других регионов, которых объединяет общее стремление к совершенствованию лечения детей с нейрохирургическими заболеваниями. Съезд служит мостом между регионами, поколениями и идеями, способствуя сотрудничеству, которое выходит за пределы национальных границ и укрепляет наше глобальное профессиональное сообщество.

Опираясь на прочный фундамент, заложенный предыдущими съездами, этот III съезд призван стимулировать стремление к совершенству, поощрять инновации и инициировать конструктивный диалог. В ходе научных сессий высокого уровня, презентаций передовых исследований и интерактивных дискуссий мы рассмотрим как стоящие перед нами сегодня вызовы, так и перспективы развития детской нейрохирургии. Вместе мы вновь подтвердим нашу приверженность делу расширения знаний, улучшения результатов лечения и формирования будущего медицинской помощи детям во всём мире.

Ереван, один из старейших в мире городов, непрерывно заселяемых людьми, — это место с богатой историей, сильным духом и теплым гостеприимством. Его дух отражает ценности нашей профессии: выносливость, преданность делу и надежду. Мы сердечно приглашаем вас познакомиться с культурой, гостеприимством и традициями Армении, а также завязать дружеские отношения и наладить сотрудничество, которые сохранятся и после завершения съезда.

Пусть этот съезд станет источником новых идей, укрепит профессиональные связи и напомним нам всем, почему мы выбрали этот благородный путь служения. Я с нетерпением жду возможности лично приветствовать вас в Ереване на этом мероприятии, которое обещает стать насыщенным, значимым и запоминающимся.

С наилучшими пожеланиями,

*Д-р Самвел Саргсян,*

*Президент Армянского общества детской нейрохирургии (АОДН)*

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## PREFACE

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The Organizing Committee is pleased to present the Proceedings of the 3rd Congress of Eurasian Association of Pediatric Neurosurgeons (EAPN 2026) organized in Yerevan, Armenia.

These proceedings reflect the collective scientific and clinical efforts of specialists dedicated to advancing pediatric neurosurgery through innovation, collaboration, education and research. The Congress serves as an international platform for the exchange of knowledge and experience among neurosurgeons, neurologists, neuroradiologists, anesthesiologists, rehabilitation specialists, nurses, researchers and allied healthcare professionals.

The abstracts and contributions included in this supplement demonstrate the rapid progress of pediatric neurosurgery and related disciplines, highlighting contemporary approaches to neuro-oncology, hydrocephalus, epilepsy

surgery, craniofacial disorders, spinal pathology, neurotrauma, minimally invasive techniques, neuroendoscopy, robotics and multidisciplinary pediatric care.

We sincerely thank all authors, speakers, reviewers, session chairs, scientific committee members and partner organizations for their valuable contributions and dedication to the success of this congress. Special appreciation is extended to the Congress Board and Editorial Board for their leadership, academic guidance and commitment to maintaining the high scientific standards of these proceedings.

We hope that this publication will serve not only as a record of the congress, but also as a meaningful educational and scientific resource that encourages future collaboration and continued advancement in pediatric neurosurgery throughout Eurasia and beyond.

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## ПРЕДИСЛОВИЕ

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Организационный комитет рад представить сборник материалов III Съезда Евразийского сообщества детских нейрохирургов (ЕСДН 2026), прошедшего в Ереване, Армения.

Данные материалы отражают коллективные научные и клинические усилия специалистов, посвятивших себя развитию детской нейрохирургии посредством инноваций, сотрудничества, образования и научных исследований. Съезд служит международной платформой для обмена знаниями и опытом между нейрохирургами, неврологами, нейрорадиологами, анестезиологами, специалистами по реабилитации, медсестрами, исследователями и другими медицинскими работниками.

Тезисы и доклады, включенные в этот сборник, демонстрируют стремительный прогресс в области детской нейрохирургии и смежных дисциплин, освещая современные подходы к нейроонкологии, гидроцефалии,

хирургии эпилепсии, черепно-лицевым патологиям, патологии позвоночника, нейротравмам, малоинвазивным методикам, нейроэндоскопии, робототехнике и междисциплинарной педиатрии.

Мы искренне благодарим всех авторов, докладчиков, рецензентов, председателей секций, членов научных комитетов и партнерские организации за их ценный вклад и преданность делу успешного проведения этого съезда. Особую признательность выражаем Совету съезда и Редакционной коллегии за их руководство, научный вклад и приверженность поддержанию высоких научных стандартов данного сборника.

Надеемся, что данный сборник послужит не только документальным свидетельством съезда, но и ценным научно-образовательным ресурсом, способствующим будущему дальнейшему сотрудничеству и постоянному развитию детской нейрохирургии в Евразии и за её пределами.

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## Surgical Treatment of “Complex” and Rare Neoplasms of the Head and Brain in Children

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**Introduction:** Brain tumors are one of the potentially life-threatening conditions, which often lead to a significant deterioration in the quality of life of children. The report presents the main modern approaches to make surgery as safe and effective as possible.

**Materials and Methods:** We analyzed the results of surgery for children with cerebral tumors (mostly malignant) and congenital diseases in a large pediatric cancer center for 2 years (Oct 2023 – Dec 2024). A total of 144 children (age: 1-18 years) underwent surgery during this period.

**Results:** The center receives children with tumors of complex localization, recurrent tumors, and complications of treatment for head tumors. The selection of patients takes place through a permanent neuro-oncological council. A number of patients are selected based on an interdisciplinary approach (head and neck tumors, metastases of solid tumors, stages in the treatment of patients with primary disseminated tumors). The work uses all modern modalities to ensure the safety of treatment at the surgical stage: microsurgery,

endoscopic assistance and ventricular endoscopy, neurophysiological monitoring, preoperative angiography and embolization of hypervascular neoplasms. Among the common pediatric tumors (IV ventricle tumors – 46 patients, supratentorial tumors, including the sellar region – 69 patients, pineal region – 6 patients), we also identified a group of patients with metastases of solid tumors in the brain – 10 patients. Sarcomas (soft-tissue sarcoma, osteosarcoma), neuroblastoma, and nephroblastoma metastasize most often. Oligo-metastatic foci can be considered as potential targets for the surgical stage in the patient's treatment program. During the described period, treatment was complicated only in 3 cases due to the features of the neoplasm (gigantic size, hypervascular nature, biological aggressiveness), 1 case resulted in the death of the patient. In the presentation, using clinical examples, we demonstrate the nuances of surgical approaches in the treatment of patients with “complex” neoplasms of the head and brain.

**Conclusion:** Independent diagnosis and selection of patients for surgical treatment in a specialized center make it possible to achieve good results in the treatment of children with complex brain and head tumors. Surgery of brain metastases is an effective and safe treatment method subject to patient selection conditions. Technology does not stand still and helps us to cope even with extremely unfavorable cases. The interaction of doctors of different specialties, informal and prompt discussion of each case is necessary to choose the right treatment method.

## Surgical Treatment of Spinal Tumors in Children

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**Introduction:** Tumors of the spine represent a special category of human diseases. This is a very large and complex group of nosologies. In the adult population, we are mainly dealing with metastatic spinal lesions, which affect treatment tactics and the general view of spinal surgeons on the problem of spinal tumor surgery. However, spinal tumors in children are known to be mostly primary; the nosology profile and biological behavior of tumors differ significantly from the adult population, which means that the treatment strategy should be completely different.

**Materials and Methods:** We analyzed the results of surgery for children with spinal tumors in a large pediatric cancer center for 2 years (Oct 2023 – Sep 2025).

A total of 33 children (age: 4-18 years, M/F: 13/20) underwent surgery during this period. Benign tumors accounted for 42%.

**Results:** The main treatment method was spinal cord decompression using laminectomy (n=15). In 4 patients, an intradural intervention was required. In addition to single-stage interventions, we also applied two- and even three-stage procedures to increase the radicalism of the operation and reduce the morbidity of the procedures, which allowed us to achieve good oncological outcomes. In patients with recurrent sacral tumors, 2 radical sacrectomies were performed after cytoreductive interventions (below the S2 and S3 levels). Together with the orthopedic group of the clinic, en bloc resections of 2 conventional pelvic with sacral invasion sarcomas were also performed without critical complications. None of the patients in the group had a new neurological deficit. All patients with neurological impairment at the start of treatment showed improvement in the Frankel scale, including from B to E. All patients from the group of malignant tumors are currently stable, without recurrence. We would like to pay special attention to a small group of patients (n=4) who underwent revision inter-

ventions due to unresolved or steadily recurring tumors, as well as secondary deformities due to loss of stability of the fixation systems. 3Dprinted individual implants, carbon transpedicular screws, and specialized dorsal fixation systems for the cervical spine were used in the operations. The operations were divided into stages depending on the patient's condition, localization, spread of the tumor, and the area of primary intervention. Monitoring of these patients revealed no signs of tumor recurrence in any case. One patient with BCOR sarcoma suffered a ureteral injury after repeated operations and radiation therapy during ventral reconstruction, which required revision and urological reconstruction with prolonged ureteral stenting. Despite this, the structure is stable, and no orthopedic or neurological complications

have been identified. There were no complications in the form of cerebrospinal fluid or massive blood loss. Interventional endovascular procedures were performed in 3 patients due to the peculiarities of tumor vascularization and the location of the main arteries: 2 embolization and 1 occlusion test of the vertebral artery. According to the occlusion test, a bypass anastomosis of the vertebral artery was performed for subsequent trapping of the artery passing through the tumor.

**Conclusion:** Independent diagnosis and selection of patients for surgical treatment in a specialized center make it possible to achieve good results in the treatment of children with spinal tumors not only in routine cases of decompression, but also during revision interventions.

## A Rare Occurrence of a Fourth Ventricle Neurocytoma Revealed with Epilepsy

**Aziz Bedioui<sup>1</sup>, Sinda Ben Zekri<sup>2</sup>, Aziz Hermassi<sup>1</sup>, Wiem Mansour<sup>1</sup>, Mouna Rkhami<sup>1</sup>, Mohamed Badri<sup>1</sup>, Kamel Bahri<sup>1</sup>, Ghassen Gader<sup>1</sup>, Ihlen Zammel<sup>1</sup>**

<sup>1</sup>Neurosurgery Department, Trauma and Severe Burns Center, Ben Arous, Tunisia

<sup>2</sup>Neurosurgery Department, Zaghouan Regional Hospital, Zaghouan, Tunisia

**Introduction:** Neurocytomas are rare neuroepithelial tumors, accounting for less than 1% of brain tumors. They are most commonly located in the lateral ventricles. Their occurrence in the fourth ventricle is exceptional, particularly in children. We report a pediatric case illustrating this unusual presentation.

**Materials and Methods:** A 5-year-old girl was admitted for tonic seizures evolving over several weeks. Neurological examination was normal, except for gait instability. Brain magnetic resonance imaging (MRI)

revealed an intraventricular lesion in the fourth ventricle, isointense on T1weighted images, heterogeneous on T2weighted images, and showing no enhancement after gadolinium administration, initially suggesting a fourth ventricle ependymoma.

**Results:** The patient underwent partial surgical resection via a median suboccipital approach. Histopathological examination, supported by immunohistochemistry (positive staining for synaptophysin and neuron-specific enolase [NSE]), confirmed the diagnosis of neurocytoma. The postoperative course was uneventful, with resolution of seizures and stability of tumor remnants

**Conclusion:** Neurocytoma of the fourth ventricle is a rare entity. Clinical presentation depends on tumor location and size. Although nonspecific, epileptic seizures may represent an unusual presenting symptom. Diagnosis relies on histopathological findings and neuronal immunomarkers. Complete surgical resection remains the treatment of choice and is associated with the best prognosis. This case highlights the rarity of fourth ventricle neurocytoma in children and underscores the importance of complete resection to prevent recurrence. Tonic seizures may, in rare cases, be the presenting sign of a ventricular tumor with neuronal differentiation.

## Acute Extradural Hematoma after Sylvian Arachnoid Cyst Shunting: An Extremely Rare Complication

**Aziz Bedioui, Aziz Hermassi, Mohamed Ali Kharrat, Farah Bahri, Ihlen Zammel, Ghassen Gader**

Neurosurgery Department, Trauma and Severe Burns Center, Ben Arous, Tunisia

**Introduction:** Sylvian arachnoid cyst represents the most common form of intracranial arachnoid cysts. Presenting symptoms vary from those of increased intracranial pressure to non-specific symptoms, such as

psychomotor delay, behavioral disorder, and seizures. There is still controversy concerning optimal management of symptomatic arachnoid cysts. Cysto-peritoneal shunting is an established treatment; however, it is associated with complications, most notably subdural collections due to overdrainage. Postoperative extradural hematoma is an exceptionally rare complication, with only limited cases reported in the literature. We present a pediatric case of acute extradural hematoma following shunt placement for a temporal arachnoid cyst.

**Materials and Methods:** We report the case of a 6-years old girl, with no notable medical history, with a normal development and excellent school results. She presented with recent headaches and occasional vomiting. Neurological examination was normal. Brain MRI showed a compressive left temporal arachnoid

cyst, with a 4mmwide subdural collection, suggesting cyst rupture.

**Results:** After discussing therapeutic options, a cystoperitoneal shunt was performed. Despite efforts, a large quantity of cyst fluid was evacuated after dural opening. During postoperative course, the patient still had bothersome headaches, without neurological deficit. Postoperative brain CT showed a large left frontal extradural hematoma causing significant mass effect. Emergency craniotomy and evacuation of the hematoma were performed. No clear source of bleeding was identified intraoperatively. The patient had a favorable outcome with immediate neurological recovery and no long-term deficits on follow-up.

**Conclusion:** The most common complications after cystoperitoneal shunt of intracranial arachnoid cyst are postoperative subdural hematomas. This occurrence is due to overdrainage of CSF and brain detachment. Extradural hematoma is a rare but potentially life-threatening complication of cystoperitoneal shunting for temporal arachnoid cysts in children. The causing mechanism is supposedly fast evacuation of CSF and sudden decrease of intracranial pressure. Early recognition and prompt surgical intervention are critical for a good outcome. Awareness of this uncommon complication may help guide postoperative monitoring and management strategies.

## Tectal Glioma in Children – What Is the Optimal Treatment Strategy?

**Marek Mandera**

Department of Pediatric Neurosurgery, Medical University of Silesia, Katowice, Poland

**Introduction:** Tectal gliomas are a rare subgroup of pediatric brainstem tumors, typically presenting with obstructive hydrocephalus rather than focal deficits. Their course is often indolent, but the midbrain location precludes safe radical resection. Management therefore focuses on cerebrospinal fluid diversion, with endoscopic third ventriculostomy preferred over shunting. The key challenge is identifying lesions at risk of progression.

**Materials and Methods:** We analyzed 34 patients treated in Katowice and reviewed published series (n=355, 2000–2020).

**Results:** In our cohort, overall survival was 100%, while tumor progression occurred in 44%, with a mean time to progression of 30 months. Histology demon-

strated marked heterogeneity: approximately 50% were pilocytic astrocytomas (WHO grade I), whereas the remainder showed high-grade features (WHO grades III–IV). Predictors of progression included tumor area >3 cm<sup>2</sup> and contrast enhancement (p<0.05). These findings align with larger series identifying tumor volume >5 cm<sup>3</sup> and cystic changes as adverse factors. Despite excellent survival (5-year OS 100%, 10-year OS 83.9%), long-term progression-free survival remains below 50%. Management of progressive disease includes biopsy with molecular profiling, radiotherapy, chemotherapy, or multimodal approaches. Observation is appropriate for small, non-enhancing lesions, whereas larger or enhancing tumors require closer surveillance and, in selected cases, histological verification. Notably, pure aqueductal tumors may follow a more aggressive course.

**Conclusion:** The optimal strategy is stepwise: safe CSF diversion, risk-adapted surveillance, and timely intervention at progression. Integration of histopathology and molecular markers, particularly MAPK pathway alterations, is essential for improved risk stratification and the development of precision therapies.

## Pineal Region Tumors in Children

**Marek Mandera**

Department of Pediatric Neurosurgery, Medical University of Silesia, Katowice, Poland

**Introduction:** Pineal region tumors remain a challenging entity in pediatric neurosurgery due to their rarity and marked histological heterogeneity. The aim of this study was to analyze treatment strategies and long-term outcomes in children treated at a single center, alongside a review of contemporary concepts in their management.

**Materials and Methods:** A retrospective review of 74 patients treated between 2000 and 2025 was performed. The mean age was 12.8 years (range 1–17), with a mean follow-up of 78 months.

**Results:** Serum AFP and  $\beta$ -hCG were assessed in all patients, and melatonin profiling in 21. Non-germinomatous germ cell tumors were identified in 14 patients (19%), all of whom were referred for oncological management. Hydrocephalus occurred in 47 patients (63%), with endoscopic third ventriculostomy performed in 33 (70%). Endoscopic biopsy was undertaken in 23 patients with negative tumor markers and hydrocephalus, confirming germinoma in 8 cases. Tumor resection was performed in 60 patients (81%) via supracerebellar infratentorial, occipital transtentorial, or posterior interhemispheric transcallosal approaches. Gross total resection was achieved in 70%. Transient neurological deterioration occurred in 43% and permanent deficits in 10%. Histologically, tumors included germ cell tumors (n=43), pineal parenchymal tumors (n=24), and others (n=7). Nine patients required reoperation for recurrence. At final follow-up, 80% were alive, while 20% died due to

progression. Outcomes were not influenced by surgical approach. The strongest prognostic factors were tumor histology and intracranial hypertension at presentation.

**Conclusion:** Management should therefore be multimodal and histology-driven, with early control of

hydrocephalus and accurate diagnosis, while tumor biology remains the principal determinant of outcome. Contemporary strategies emphasize risk-adapted, multidisciplinary approaches integrating surgery, oncology, and molecular profiling.

## Endoscopic Endonasal Approaches for Pediatric Craniopharyngiomas: A Review of Endocrine and Visual Outcomes

Artur Rizer<sup>1</sup>, Garni Barkhoudarian<sup>2</sup>

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<sup>2</sup>Department of Neurosurgery, Pacific Neuroscience Institute, Providence St. John's Medical Center, Santa Monica, CA, USA

**Introduction:** Craniopharyngiomas are rare tumors that arise from the remnants of Rathke's pouch with solid or cystic consistency and a bimodal distribution, including the pediatric population. The majority of symptoms are due to the mass effect of the tumor, compressing the surrounding tissue and causing hypothalamic-pituitary deficits, visual disturbances, and an increase in intracranial pressure. Historically, pediatric craniopharyngiomas were treated primarily with the transcranial approach (TCA). In the past two decades, the endoscopic endonasal approach (EEA) has become more favorable, leading to a debate regarding efficacy and better outcomes between these two approaches.

**Objective:** To compare endocrine and visual outcomes in pediatric patients with craniopharyngioma who received either transcranial or endoscopic endonasal resection of the neoplasm.

**Materials and Methods:** A systematic search of PubMed was conducted for studies published between the years 2015 and 2026. The search strategy included the following keywords: craniopharyngioma; endonasal OR transsphenoidal OR "endoscopic endonasal"; out-

comes; endocrine; visual; pediatric. Inclusion criteria focused on pediatric cohorts undergoing endoscopic endonasal resection for craniopharyngioma with documented and reported data regarding pre- and post-surgical endocrine and ophthalmologic outcomes and complications. The initial search identified 70 articles, of which 10 cohort studies and 1 case series were chosen that corresponded to our inclusion criteria.

**Results:** A total of 370 patients were included in these studies. The average age ranged between 7.5 and 12 years old, and the average follow-up period was between 20 and 93.6 months (Table 1). Most of the tumors were suprasellar, were larger than 3 cm, and had mixed cystic-solid consistency. Gross total resection was achieved in 81.4% of EEA cases and 64.5% of TCA cases. In patients presenting with visual disturbances, there was visual improvement in 37.3% to 83% of the EEA cases and 25% in TCA cases, as mentioned by one study comparing both approaches. Endocrine complications were frequent, with new-onset panhypopituitarism occurring in up to 100% of the patients, and diabetes insipidus in 29.4% to 84% of cases. CSF leak was only observed in EEA groups, ranging from 5% up to 24% (Table 2). A recent study conducted by Do et al. (2026) presents a detailed comparison of visual outcomes in pediatric patients who have undergone EEA and TCA.

**Conclusion:** The current evidence supports EEA as a safe and effective first-line surgical approach for pediatric midline craniopharyngiomas, with high rates of gross total resection and visual improvement and similar percentages in new panhypopituitarism cases between approaches. There was no significant difference in visual outcomes between the two approaches. Further studies are needed to determine the morphological preservation of the pituitary stalk and endocrine functions after EEA versus TCA.

**Table 1:** Patient Demographics and Tumor Characteristics

| Author, Year            | Approach | M/F, n | Mean Age, years | Mean Followup, months | Tumor Location                                                                                                 | Tumor Size                    | Tumor Consistency                                  |
|-------------------------|----------|--------|-----------------|-----------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------|
| Caklili et al., 2023    | EEA      | 32/21  | 11.9            | 53.6                  | Suprasellar 13.2%, Sellar-suprasellar 52.8%, Sellar 32.1%, Infraselar 1.9%                                     | 28.8 mm                       | Mixed 47.2%, Cystic 30.2%, Solid 22.6%             |
| d'Avella et al., 2019   | EEA      | 8/4    | 12.0            | 78                    | Supradiaphragmatic 41.7%, Infradiaphragmatic 58.3%                                                             | Not specified                 | Mixed 58.3%. Mainly cystic 41.7%                   |
| Elshazly et al., 2025   | EETA     | 9/5    | 11.1            | 28.3                  | Presellar 35.7%, Sellar 43.9%, Postsellar 7.1%, Conchal 14.3%                                                  | 2.7-5.2 cm; mean 3.6 cm       | Mixed 78.6%, Solid 14.3%, Cystic 7.1%              |
| Madsen et al., 2019     | EEA      | 21/7   | 8.9             | 20                    | Suprasellar 53.6%, Sellar-suprasellar 42.9%, Sellar 3.6%                                                       | Not specified                 | Mixed 50%, Mainly solid 28.6%, Mainly cystic 21.4% |
|                         | TCA      | 6/9    | 6.6             | 79                    | Suprasellar 60%, Sellar-suprasellar 40%                                                                        |                               | Mixed 53.3%, Mainly cystic 40%, Mainly solid 6.7%  |
| Mazzatenta et al., 2020 | EEA      | 13/12  | 8.9             | 72                    | Supradiaphragmatic Sellar 44%, Infradiaphragmatic Sellar 12%, Pure Suprasellar 40%, Endosellar 4%              | >3 cm in 18 cases (72%)       | Mixed 80%, Cystic 12%, Solid 8%                    |
| Patel et al., 2017      | EEA      | 11/5   | 11.0            | 50                    | Suprasellar 93.8%, Intrasellar 68.8%, Retroclivar 6.25%, Intraventricular 6.25%, Infraselar+Nasal cavity 6.25% | 1.8-9.0 cm; mean 3.98 cm      | Mixed 75%, Purely solid 12.5%, Purely cystic 12.5% |
| Patel et al., 2022      | EEA      | 30/12  | 8.0             | 49                    | Suprasellar 100%, Suprasellar + 3rd ventricle 11.9%, Suprasellar + sphenoid sinus 4.8%                         | 1.3-9.6 cm; mean 3.6 cm       | Mixed 50%, Cystic 50%                              |
| Scagnet et al., 2025    | EEA      | 16/13  | 9.6             | 67.2                  | Infradiaphragmatic 3.4%, Supradiaphragmatic infrachiasmatic 24.1%, Suprachiasmatic 65.5%                       | Not specified                 | Mixed 55.2%, Cystic 27.6%, Solid 17.2%             |
| Schelini et al., 2020   | EEA      | 8/12   | 7.5             | 63.6                  | Suprasellar 60%, Suprasellar + 3rd ventricle 15%, Sellar 25%                                                   | Not specified                 | Mixed 75%, Cystic 25%                              |
| Wu et al., 2021         | EEA      | 22/13  | 12.0            | 40.5                  | Suprasellar 45.7%, Sellar-suprasellar 45.7%, Sellar 8.6%                                                       | 14.6 cm <sup>3</sup>          | Mixed 57.2%, Cystic 28.6%, Solid 14.3%             |
|                         | TCA      | 9/7    | 11.5            | 66                    | Suprasellar 62.5%, Sellar-suprasellar 37.5%                                                                    | 16.7 cm <sup>3</sup>          | Mixed 50%, Cystic 43.8%, Solid 6.2%                |
| Yamada et al., 2018     | EEA      | 37/28  | 9.6             | 93.6                  | Suprasellar 46%, Supradiaphragmatic 46%, Sellar 8%                                                             | <2cm 8%, 2-4cm 74%, >4 cm 18% | Mixed 54%, Cystic 46%                              |

Table 2: Patient Outcomes

| Author, Year            | Approach | GTR   | Visual Outcomes                                       | New Panhypopituitarism                       | New Diabetes Insipidus | New Hypothalamic Obesity                                | Other Endocrine Outcomes                                                                                            | CSF leak |
|-------------------------|----------|-------|-------------------------------------------------------|----------------------------------------------|------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------|
| Caklili et al., 2023    | EEA      | 64.1% | Improved 37.3%,<br>Unchanged 58.8%,<br>Worsened 3.9%  | Not specified                                | 79.2%                  | 11.6%                                                   | ACTH deficiency 5.7%,<br>TSH deficiency 28.3%, GH deficiency 7.5%                                                   | 11.3%    |
| d'Avella et al., 2019   | EEA      | 75%   | Improved 83%,<br>Unchanged 17%,<br>Worsened 0%        | 25% from partial                             | 36%                    | Not specified                                           | Not specified                                                                                                       | 8%       |
| Elshazly et al., 2025   | EETA     | 35.7% | Improved 57.1%,<br>Unchanged 28.6%,<br>Worsened 14.3% | 35.7%                                        | 14.2%                  | 28.6%                                                   | Partial anterior pituitary dysfunction 35.7%                                                                        | 7.1%     |
| Madsen et al., 2019     | EEA (28) | 85.7% | Not specified                                         | 92.8%                                        | Not specified          | 22.2%                                                   | Not specified                                                                                                       | 7.1%     |
|                         | TCA (15) | 53.3% | Not specified                                         | 100%                                         |                        | 40%                                                     |                                                                                                                     | 0%       |
| Mazzatenta et al., 2020 | EEA      | 92%   | Improved 43%,<br>Unchanged 53%,<br>Worsened 4%        | 92%                                          | Not Identified         | 12%                                                     | Partial anterior pituitary dysfunction 8%                                                                           | 24%      |
| Patel et al., 2017      | EEA      | 93.7% | Improved 69.2%,<br>Unchanged 30.8%,<br>Worsened 0%    | 63.6%                                        | 46.7%                  | 37.5%                                                   | Not specified                                                                                                       | 18.8%    |
| Patel et al., 2022      | EEA      | 90.5% | Improved 48%,<br>Unchanged 52%,<br>Worsened 0%        | 89.7%                                        | 77.8%                  | 19.5%                                                   | Not specified                                                                                                       | 7.1%     |
| Scagnet et al., 2025    | EEA      | 75.8% | Improved 0%,<br>Unchanged 93%,<br>Worsened 7%         | 100%                                         | Not Identified         | Noted higher BMI on last follow-up in younger patients. | Not specified                                                                                                       | 6.8%     |
| Schelini et al., 2020   | EEA      | 70%   | Unchanged 100%                                        | 55%                                          | Not specified          | Not specified                                           | Not specified                                                                                                       | 5%       |
| Wu et al., 2021         | EEA (35) | 94.3% | Improved 40%,<br>Unchanged 60%,<br>Worsened 0%        | 35.3% (8.8% from normal, 26.5% from partial) | 29.4%                  | Not specified                                           | ACTH deficiency 55.9%, TSH deficiency 55.9%, Hypogonadism 64.7%, GH deficiency 26.5%, Partial hypopituitarism 35.3% | 5.7%     |
|                         | TCA (16) | 75%   | Improved 25%,<br>Unchanged 50%,<br>Worsened 25%       | 60% (26.7% from normal, 33.3% from partial)  | 60%                    |                                                         | ACTH deficiency 80%, TSH deficiency 80%, Hypogonadism 33.3%, GH deficiency 73.3%, Partial hypopituitarism 20%       | 0%       |
| Yamada et al., 2018     | EEA      | 91%   | Improved 62%,<br>Unchanged 27%,<br>Worsened 11%       | 41.5% (4.6% from normal, 36.9% from partial) | 84%                    | 12.3%                                                   | Not specified                                                                                                       | 9.2%     |

## Prognostic Factors for the Development of Cerebellar Mutism in Children Undergoing Fourth Ventricle Brain Tumor Resection

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**Background:** This study of prognostic factors causing cerebellar mutism syndrome (CMS) in children undergoing resection of fourth ventricle tumor is a retrospective one. Based on statistics of 10 pediatric cases treated in a neurosurgery clinic in Ukraine, the authors single out the size of the tumor as a vital factor predicting its development as the volumes of surgical excision were defined over 25cm<sup>3</sup> which were highly influential to the presence of CMS. The other variables namely, tumor histology, the age of the patient, and the extent of resection, found to have no significant correlation. All the surgeries used the telovelar approach, procedures done by one surgeon and had the use of intraoperative neurophysiological monitoring to save the cerebellar structures. Results strengthen the point to preoperative planning of volumetric tumor analysis, since it is probable that larger tumors will necessitate greater manipulation of vital cerebellum pathways.

**Materials and Methods:** PubMed search was done for literature published in the last 5 years relating to the neuroanatomy of the cerebellum, infra-tentorium and brain stem, cerebellar mutism syndrome, pediatric oncology and radio-oncological imaging, these literatures were reviewed to gain a wider knowledge of the experience of other authors on the said objective. This qualitative retrospective study utilized secondary data from pediatric patients who had undergone a surgical resection of fourth ventricle brain tumors in the Regional Clinic Center of Neurosurgery and Neurology,

in Uzhhorod, Ukraine. The study included 10 successive patients younger than 16 years. Presurgical MR images were analyzed in order to measure the tumor volume, and surgical data were reviewed in relation to approach and resection status. Histopathological and immunohistochemical evaluations were conducted to determine tumor classifications. A special speech evaluation test is done for the outcomes of the operation in order to detect CMS. In this matter, the goal was to understand the factors associated with preoperative and intraoperative process.

**Conclusion:** CMS is a very serious and distressing dilemma that occurs in children undergoing resection of brain tumor from the fourth ventricle. Even though advancements have been made in the field of surgical techniques and imaging technologies, the syndrome appears to be unpredictable and thus poses great challenges. This study has identified several strong prognostic factors associated with the development of the syndrome, including tumor location, tumor size, closeness to the dentate nuclei and cerebellar peduncles, age, and aggressiveness of the surgical procedure. The central features of understanding the pathophysiology of the condition seem to be the pathway into cerebello-cerebral circuits, principally that of dentate-thalamo-cortical. Thus, understanding these risk factors provides the neurosurgeon, neurologist, and rehabilitation specialist with benefits in anticipation, prevention, and effective management in case of the occurrence of cerebellar mutism. Early recognition of such patients can give better surgical planning, individual intervention, and family preparedness for consequences. This condition is known to be usually transient but has long-lasting effects on cognition, emotions, and social considerations. Future research will have to improve the knowledge of the mechanisms involved, in conjunction with company strategies, to minimize incidence and improve rehabilitation prognosis for afflicted children. To address the risks of the CMS, this study suggests improved imaging protocol as well as multidisciplinary cooperation. Although the study has limitations of sample size, the outcomes reveal beneficial information in the planning of surgery and other clinical outcomes in a neurosurgery setting.

## Наш опыт хирургического лечения внутричерепных арахноидальных кист у детей

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**Введение:** Арахноидальные кисты – это доброкачественные образования, заполненные ликвороподобной жидкостью и расположенные между листками паутинной оболочки головного мозга. В большинстве случаев они протекают бессимптомно и выявляются случайно при нейровизуализации. Однако при значительных размерах или неблагоприятной локализации кисты могут приводить к повышению внутричерепного давления, развитию судорожного синдрома, задержке психомоторного развития, головным болям и очаговой неврологической симптоматике.

**Цель:** Уточнение выбора методов хирургического лечения при различных типах арахноидальных кист у детей.

**Материалы и методы:** Проведено обследование детей с врождёнными арахноидальными кистами в возрасте от 3 месяцев до 17 лет. Все пациенты прошли клиническо-неврологическое обследование. При открытом родничке проводилась нейросонография, но основным методом диагностики являлись компьютерная томография (КТ) и магнитно-резонансная томография (МРТ). Показания к хирургическому лечению определялись индивидуально и включали наличие выраженной клинической симптоматики, прогрессирующее увеличение размеров кисты по данным КТ/МРТ, развитие гидроцефалии, а также риск разрыва или кровоизлияния. Существенное значение

имели возраст пациента, локализация кисты и степень компрессии окружающих структур головного мозга.

**Результаты и обсуждение:** Существует несколько основных хирургических подходов к лечению арахноидальных кист у детей. Одним из наиболее современных и широко применяемых методов является эндоскопическая фенестрация кисты, при которой создаётся сообщение между полостью кисты и субарахноидальным пространством или желудочковой системой. Это обеспечивает адекватный отток жидкости и уменьшение размеров кисты. Метод отличается минимальной инвазивностью, меньшей травматичностью и более быстрым восстановлением по сравнению с открытыми вмешательствами. Микрохирургическое удаление или иссечение стенок кисты применяется при поверхностной локализации кист. Данный подход требует выполнения краниотомии и характеризуется большей инвазивностью, однако позволяет добиться радикального устранения патологического процесса. Также используется кистоперитонеальное шунтирование, предусматривающее установку дренажной системы для постоянного оттока жидкости в брюшную полость. Несмотря на клиническую эффективность, этот метод ассоциирован с риском инфекционных осложнений, обструкции шунта и необходимостью повторных вмешательств, что ограничивает его применение.

**Заключение:** Выбор метода хирургического лечения арахноидальных кист определяется совокупностью факторов, включая анатомические особенности кисты, возраст пациента, клиническую картину, а также опыт нейрохирурга и технические возможности учреждения. Современные хирургические технологии позволяют минимизировать риски и достигать высоких клинических результатов, что делает своевременную диагностику и обоснованный выбор тактики лечения ключевыми факторами благоприятного исхода.

## Frequency-Tuned and State-Dependent Intracranial Neuromodulation

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**Introduction:** Optimization of non-invasive brain stimulation remains a major challenge due to limited understanding of its direct effects on human deep brain structures. Intracranial evidence linking stimulation parameters to neural dynamics is critically needed.

**Objective:** To determine whether transcranial alternating current stimulation (tACS) induces frequency-specific and state-dependent modulation of human deep brain networks.

**Materials and Methods:** We analyzed stereo-electroencephalography (SEEG) recordings from patients undergoing invasive monitoring for epilepsy. Multi-frequency tACS (5, 10, 20, 40 Hz) was delivered over prefrontal regions while local field potentials were recorded from the hippocampus and amygdala. Oscillatory power changes were quantified across canonical frequency bands, and their relationship to baseline activity was assessed to evaluate state-dependent modulation.

**Results:** tACS induced robust modulation of intracranial neural oscillations, with marked regional and frequency specificity. Strikingly, 10 Hz stimulation produced the most consistent and sustained modulation in the hippocampus across multiple frequency bands, whereas responses in the amygdala were heterogeneous and less persistent. Importantly, stimulation effects were strongly state-dependent, with baseline oscillatory activity inversely correlated with modulation magnitude. These findings suggest that the human brain operates as a frequency-tuned filter, preferentially amplifying stimulation aligned with intrinsic network dynamics.

**Conclusion:** This study provides rare intracranial human evidence that neuromodulation efficacy is governed by both stimulation frequency and brain state. The selective sensitivity of the hippocampus to 10 Hz stimulation identifies a mechanistically grounded target for precision neuromodulation. These findings redefine parameter selection strategies and have direct implications for network-level interventions in epilepsy and cognitive disorders.

## Delayed-Onset Drug-Resistant Epilepsy Following Pediatric Hemispheric Tumor Resection: A Longitudinal Case Study

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**Introduction:** Early-life structural brain lesions and neurosurgical interventions predispose patients to ep-

ileptogenesis. Although initial postoperative seizure control may be achieved, long-term outcomes can evolve unpredictably. Evidence suggests that seizure freedom rates decline with extended follow-up, with most recurrences occurring within the first few years; however, delayed-onset epilepsy beyond a decade post-surgery has been documented. We present a case of drug-resistant epilepsy developing more than ten years after hemispheric tumor resection, underscoring the importance of long-term neurological surveillance in pediatric brain tumor survivors.

**Materials and Methods:** We retrospectively reviewed the longitudinal clinical course, electroencephalographic (EEG) findings, and neuroimaging data of a

patient who underwent complete resection of a large left hemispheric tumor at 16 months of age. Serial neurological evaluations, EEG recordings, and magnetic resonance imaging (MRI) were performed from childhood through adulthood.

**Results:** Following surgery, the patient remained clinically stable during early childhood with only mild right-sided hemiparesis. At the age of 11 years, nocturnal generalized tonic-clonic seizures emerged and were initially controlled with antiseizure medication. During adolescence, seizure semiology evolved to focal seizures with impaired awareness, progressively increasing in frequency. By adulthood, the patient experienced frequent clustered seizures during both wakefulness and sleep despite trials of multiple antiseizure medications, meeting criteria for drug-resistant epilepsy. Serial EEG

recordings demonstrated persistent focal epileptiform discharges over the left frontocentral region with sleep activation. Longitudinal MRI studies revealed stable postoperative changes, including encephalomalacia and ex vacuo ventricular enlargement, without evidence of tumor recurrence or progressive structural abnormalities.

**Conclusion:** This case demonstrates that delayed-onset drug-resistant epilepsy can develop more than a decade after pediatric hemispheric tumor resection, even with radiological stability. These findings support the hypothesis that epileptogenesis represents a prolonged, dynamic process following early structural brain injury. Long-term neurological surveillance is warranted in pediatric brain tumor survivors, with prompt referral to specialized epilepsy centers when seizures become medically refractory.

## Molecular Remodeling of the Epileptic Cortex: The Role of VGLUT2 and GAD65 Neurotransmitter Imbalance

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**Introduction:** Drug-resistant epilepsy involves structural and functional synaptic plasticity known as molecular remodeling. This study investigates the homeostatic disruption of excitatory and inhibitory neurotransmission and the activation of apoptotic pathways within the epileptogenic zone (EZ) to elucidate their role in cortical rearrangement and potential as surgical outcome predictors.

**Materials and Methods:** We analyzed 38 brain biopsy samples from patients undergoing surgery for drug-resistant temporal epilepsy. The cohort included EZ (n=10) and perifocal zone (PZ, n=10) samples identified via intraoperative electrocorticography, alongside a comparison group (n=13) without epilepsy. Targeted biopsies from the hippocampus (n=2) and scarred tissue (n=3) were also evaluated from patients with epilepsy. Protein expression (GAD65, NR2B, VGlut2, p53, Caspase-8) was quantified using Western blot normalized to GAPDH. Statistical analysis was performed using the Mann-Whitney U-test ( $p < 0.05$ ).

**Results:** A profound excitatory upregulation was observed in the EZ. VGlut2 expression was nearly 12-fold higher than in controls ( $5.8 \pm 1.75$  vs.  $0.49 \pm 0.16$ ;  $p < 0.001$ ), while the NR2B subunit reached  $5.05 \pm 1.63$  ( $p < 0.05$ ). Despite elevated GAD65 in the EZ ( $6.51 \pm 2.06$ ), this compensatory response failed to counteract the

glutamatergic surge. Pro-apoptotic signaling was evident in the EZ (p53:  $4.17 \pm 1.79$ ; Caspase-8:  $4.44 \pm 1.29$ ) and hippocampus. Conversely, scarred tissue exhibited protein levels comparable to controls. Notably, no statistical divergence was found between the EZ and PZ ( $p > 0.05$ ). The elevation of VGlut2 and NR2B within the EZ confirms that chronic epileptogenesis is driven by a massive glutamatergic shift. VGlut2, as a vesicular transporter, facilitates increased glutamate loading into synaptic vesicles, while the upregulation of NR2B subunits enhances post-synaptic sensitivity to excitatory stimuli. The observed rise in GAD65 expression suggests an endogenous attempt to restore inhibitory tone; however, the persistence of seizures indicates that this GABAergic compensation is functionally insufficient to neutralize the excitatory "storm." The lack of significant protein expression differences between the EZ core and the PZ is a critical finding. It suggests that molecular "epileptization" creates a broad pathological field that extends beyond the primary electrophysiological focus. This biochemical gradient explains why limited resections often fail in pharmacoresistant cases. Furthermore, the correlation between high neurotransmitter turnover and pro-apoptotic markers (p53 and Caspase-8) indicates that molecular remodeling is not a stable state but a progressive neurodegenerative process. The metabolic stress induced by hyperexcitability likely triggers the receptor-mediated apoptotic pathway, leading to further synaptic maladaptation. In contrast, the molecular "silence" of scarred tissue suggests that the active epileptogenic network resides in viable but reorganized cortex rather than in sclerotic areas alone.

**Conclusion:** Drug-resistant epilepsy is maintained by a critical VGlut2/GAD65 imbalance and progressive apoptotic signaling. Molecular remodeling encompasses a broad cortical field, providing a biological rationale for optimizing surgical margins. The VGlut2/GAD65 ratio serves as a potential biomarker for evaluating the depth of cortical reorganization.

## CRANIOSYNOSTOSIS AND CRANIOFACIAL

### Endoscopic Management of Craniosynostosis in Early Infancy: Outcomes and Clinical Experience

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**Introduction:** Craniosynostosis is defined as the premature fusion of one or more cranial sutures, leading to abnormal skull morphology and potentially restricted brain growth. It occurs in approximately 1 in 2,000–2,500 live births and is slightly more common in males. Clinical manifestations include abnormal head shape, palpable ridging over fused sutures and in some cases increased intracranial pressure or developmental delay. In recent years, endoscopic techniques have emerged as a minimally invasive alternative to traditional open surgery, particularly for single-suture (nonsyndromic) craniosynostosis, offering improved recovery profiles and reduced surgical morbidity.

**Materials and Methods:** This study presents the application of endoscopic craniosynostosis surgery in infants with sagittal and metopic synostosis. Patients were operated at an early age, ranging from as young as 23 days to a median age of 69 days. Procedures were performed under general anesthesia using small (~3 cm) incisions and endoscopic assistance. Burr holes

were created to allow safe detachment of the dura mater and resection of the fused suture. Osteotomies were carried out using scissors and, when necessary, a drill for deeper segments. Postoperatively, all patients underwent helmet therapy for several months to guide cranial remodeling. Outcomes were assessed using clinical evaluation, cephalic index (CI) measurements, and 3D stereophotogrammetric analysis during follow-up.

**Results:** The results demonstrated significant improvement in cranial shape and quantitative indices. In sagittal craniosynostosis, the CI improved from a median of approximately 61% preoperatively to 74.2% postoperatively, with some cases reaching up to 80%. Metopic cases also showed notable aesthetic and structural correction. The average operative time was approximately 30-40 minutes, with minimal blood loss and low transfusion rates. Hospital stay was short, typically around 2 days, with rapid postoperative recovery. Complications were rare and included no infections were observed.

**Conclusion:** Endoscopic craniosynostosis surgery is a safe and effective treatment option, particularly for early-presenting, single-suture cases. It offers a minimally invasive approach with shorter operative time, reduced blood loss, and faster recovery compared to open techniques. Optimal outcomes depend on early intervention (preferably before 6 months of age), adherence to postoperative helmet therapy, and careful long-term follow-up. Parental compliance plays a critical role in ensuring successful cranial remodeling and overall treatment success.

### Early Diagnosis and Surgical Intervention in Achondroplasia-Related Foramen Magnum Stenosis

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**Introduction:** Although relatively uncommon within certain populations, achondroplasia remains the most prevalent skeletal dysplasia and is frequently associated with foramen magnum stenosis. This condition poses significant risk due to compression of the brainstem and upper cervical spinal cord, potentially leading to neurological deficits and life-threatening respiratory complications. Early diagnosis and timely surgical intervention are critical to prevent long-term morbidity.

**Materials and Methods:** We present a case series of pediatric patients with achondroplasia who developed clinically significant foramen magnum stenosis. Clinical presentation, neuroimaging findings, genetic data (when available), surgical management and outcomes were retrospectively analyzed. All patients underwent posterior fossa decompression based on radiological evidence of stenosis and corresponding clinical symptoms.

**Results:** Patients presented with a spectrum of symptoms, including central apnea, hypotonia, developmental delay and respiratory distress. Neuroimaging consistently demonstrated varying degrees of foramen magnum narrowing with brainstem compression. Posterior fossa decompression was performed in all cases resulting in resolution of central apnea and significant neurological improvement. Respiratory function improved within 1-2 months following surgery. No major perioperative complications were observed. Follow-up demonstrated sustained clinical improvement and prevention of further neurological deterioration.

**Conclusion:** This case series highlights the critical role of early diagnosis and timely surgical decompression in achondroplasia-related foramen magnum stenosis. Posterior fossa decompression effectively relieves brainstem compression leading to resolution of central apnea, significant motor improvement and

measurable improvement in respiratory function within 1–2 months postoperatively. Prompt intervention, combined with regular surveillance and a multidisciplinary approach, is essential to optimize neurological and respiratory outcomes to prevent long-term complications in this vulnerable patient population.

## Sural Nerve Graft for Autologous Facial Nerve Reconstruction Following Vestibular Schwannoma Resection

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**Introduction:** Facial nerve injury is a significant postoperative complication in vestibular schwannoma surgery, often resulting in severe functional impairment and psychosocial distress. Traditional reconstructive approaches, including direct anastomosis or interposition grafting, have variable outcomes. Our study evaluates the use of a sural nerve autograft secured with fibrin-based biological adhesive as an alternative technique to enhance axonal regeneration and minimize secondary trauma associated with microsuturing.

**Objectives:** To assess the efficacy of autologous facial nerve reconstruction utilizing a sural nerve graft for restoring neural continuity and functional recovery following iatrogenic facial nerve transection during vestibular schwannoma resection.

**Materials and Methods:** A prospective cohort of 10 patients with complete intraoperative facial nerve tran-

section underwent immediate autologous sural nerve grafting. Preoperative ultrasonography was utilized for precise anatomical localization of the facial nerve. Intraoperative neuromonitoring, including direct electrical stimulation and continuous electromyography, was employed to optimize graft positioning and ensure functional integrity of proximal nerve stumps. The graft was secured using fibrin glue to facilitate atraumatic coaptation. Functional recovery was evaluated postoperatively at 12 months using electrophysiological assessments (nerve conduction studies, needle electromyography) and standardized clinical grading scales.

**Results:** Follow-up electrophysiological testing at 12 months demonstrated partial axonal regeneration across the graft with focal conduction block, indicating early but incomplete functional recovery. Clinically, patients exhibited variable degrees of facial muscle reinnervation, with improved tone and voluntary movement in affected regions. No cases of significant fibrosis, neuroma formation, or graft rejection were observed.

**Conclusion:** Autologous facial nerve reconstruction using a sural nerve graft in combination with fibrin-based adhesion represents a viable technique for post-schwannoma repair, offering an alternative to traditional suture-based anastomosis. While early functional recovery is promising, further longitudinal studies are required to refine surgical protocols and optimize long-term outcomes.

## Navigating the Complexity of Craniopagus Twin Separation Surgical Strategies and Lessons from the Saudi National Experience

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Craniopagus twins represent one of the rarest and most complex forms of conjoined twinning, posing extraordinary surgical, neurovascular, and ethical challenges. Successful separation requires meticulous preoperative planning, detailed understanding of shared venous anatomy, staged operative strategies, and close coordination within a highly specialized multidisciplinary team.

Over the past decades, the Saudi National Conjoined Twins Program at King Abdulaziz Medical City, Riyadh, has developed extensive experience in managing complex craniopagus twins, performing multiple staged separations with favorable outcomes. Advances in neuroimaging, 3D-modeling, and virtual surgical planning, have significantly improved surgical safety and strategic decision-making.

This lecture presents key surgical principles in craniopagus twin separation, highlights the critical role of venous anatomy in determining operative strategy, and discusses the value of staged separation techniques. Selected illustrative experiences from the Saudi National Program will be shared to demonstrate practical challenges, decision-making pathways, and lessons learned.

Beyond technical aspects, the presentation emphasizes the humanitarian dimension of these procedures and the importance of international collaboration in advancing care for these exceptionally rare cases.

## Comparative Performance of Fixation Plates in Pediatric Cranial Remodeling

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**Introduction:** Craniosynostosis is a developmental craniofacial anomaly, in which one or more cranial sutures close prematurely. Craniosynostosis can be either isolated or associated to other abnormalities or syndromes.

**Objective:** Comparing positive and negative outcomes of three fixation approaches in craniosynostosis remodeling.

**Materials and Methods:** A retrospective study was conducted on pediatric patients with different types of craniosynostosis over a five-year period (2021-2026). The patients underwent cranial remodeling in Sourb Astvatsamayr Medical Center. We have stratified the patients into 3 groups according to the cranial fixation plate material: metal plates, resorbable PDLLA and PLLA-PGA plates and remodeling without fixation. In the study we documented postoperative outcomes of each case, their advantages, disadvantages and the necessity of revision surgery.

**Results:** In the first group the complications associated to the metal plates are relatively higher compared to the resorbable plates. In case of metal plates there was risk of infection and inflammation. Another disadvantage is that these plates must be removed through revision surgery, which is associated with additional trauma and other surgical risks. The second group, in which the patients' calvarial remodeling defect was fixed with resorbable plates, has shown no complications. No revision surgery was required to remove the plates, as the material gets resorbed in twelve to thirty months. Patients in the third group, who underwent surgery without fixation, had a higher risk of cranial injury, bleeding, and cerebrospinal fluid leakage due to the unfixed cranial remodeling defect and the susceptibility to unexpected head trauma at this age. These complications may also require repetitive surgery and may increase the infection risks. Overall, resorbable plates were associated with no complication rates.

**Conclusion:** Cranial remodeling can be performed using several approaches, including fixation with metal plates, fixation with resorbable plates or remodeling without fixation. Among the three approaches, the fixation with resorbable plates demonstrated no complication rates and the best healing outcomes with better osteosynthesis. Understanding the comparative outcomes of these three fixation methods promotes the decision making for calvarial remodeling in pediatric neurosurgery.

## Tailored Surgical Management of Complex Nonsyndromic Craniosynostosis in Early Childhood: A Single-Center Experience

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**Introduction:** Complex nonsyndromic craniosynostosis is a rare pediatric condition involving premature fusion of multiple cranial sutures without an associated genetic syndrome. Craniosynostosis occurs in approximately 1 in 2,000–2,500 live births, with over 85% involving a single suture. Multisuture nonsyndromic cases are uncommon and require specialized surgical management.

**Materials and Methods:** We retrospectively reviewed 32 children diagnosed with multisuture craniosynostosis, most identified at birth and followed for variable periods. All patients underwent open surgical treatment. Genetic testing was negative for FGFR and

TWIST mutations in all cases. The median age at surgery was 6 months (range, 4–24 months). Commonly involved sutures included coronal, sagittal, and lambdoid. All patients presented with cranial deformities, and 70% had clinical signs of increased intracranial pressure. Preoperative evaluation included CT with 3D reconstruction in all patients and MRI in 20 cases. Twelve patients underwent multisuture craniectomy with suture release alone, while 20 underwent craniofacial remodeling with orbital rim advancement and frontal bone repositioning.

**Results:** Follow-up ranged from 1 month to 10 years. Four patients required reoperation for recurrence. Five patients required ventriculoperitoneal shunt placement due to hydrocephalus or persistent intracranial hypertension. Cosmetic outcomes were variable: 19 families (59%) reported satisfaction, while 13 (41%) were dissatisfied with the final results.

**Conclusion:** Complex nonsyndromic craniosynostosis requires individualized surgical strategies based on suture involvement and clinical presentation. Although acceptable outcomes can be achieved in most cases, a notable proportion of patients require secondary interventions. Long-term follow-up is essential to detect recurrence, manage intracranial pressure, and optimize cosmetic results.

## Multimodal Management of Trigeminal Neuralgia, Hemifacial Spasm and Other Vascular Compression Syndromes

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**Introduction:** Trigeminal neuralgia is a severe and challenging condition affecting many patients for years prior to definitive treatment. Medication therapy is first line and somewhat effective, but has dose related cognitive side effects. Advances in multimodal management have expanded therapeutic options tailored to underlying etiology and patient-specific factors.

**Materials and Methods:** Depending on the etiology of the pain, non medication treatment include surgery for microvascular decompression of the

trigeminal nerve, stereotactic radiosurgery, percutaneous rhizotomy, temporomandibular joint (TMJ) therapy and Deep Brain Stimulation to name a few. These treatment options will be discussed in this review lecture.

**Results:** Medical therapy provides initial symptom control in many patients but is frequently insufficient over time. Microvascular decompression offers the highest rates of long-term pain relief in appropriately selected patients with neurovascular conflict. Minimally invasive procedures such as radiosurgery and percutaneous rhizotomy demonstrate favorable outcomes in patients unfit for open surgery, though with variable durability. Adjunctive and alternative therapies, including TMJ management and neuromodulation, may benefit selected or refractory cases.

**Conclusion:** A multimodal, individualized approach is essential for optimal management of trigeminal neuralgia, hemifacial spasm and related syndromes. Careful patient selection and integration of medical, surgical and minimally invasive techniques can significantly improve outcomes and quality of life.

## The Effectiveness of Selective Dorsal Rhizotomy in Non-Ambulatory Patients (GMFCS IV-V)

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**Introduction:** Cerebral palsy in children (CP) engage a group of motor and postural stable developmental disorders, which limit functional activity of the patient, that is caused by brain damage and/or brain developmental abnormalities encountering in 20% of patients with CP. There is no etiopathogenetic treatment for cerebral palsy, so the goal of treatment is to eliminate the underlying disorders that impair quality of life, including in caregivers. Hypertonicity, synkinesis, the phenomenon of pathological muscle contraction, startle reflex and pathological tonic reflexes lead to limited movement, formation of contractures, development of pain that enhances spasticity, and seriously complicate daily care, especially in Gross Motor Function Classification System (GMFCS) IV-V patients.

**Objective:** To evaluate the effectiveness of selective dorsal rhizotomy (SDR) in non-ambulatory patients in the treatment of spasticity and pain.

**Materials and Methods:** A total of 104 non-ambulatory patients with a GMFCS level of IV-V were operated on. Their ages at the time of the SDR ranged from 3.4 to 17.9 years, with a median age of 8.3 years; 83 (79.8%) were male and 21 (20.2%) were female. Spasticity was assessed using the Modified Ashworth Scale (MAS), pain was assessed using the Wong-Baker scale, and maternal sleep quality was assessed using the Spiegel scale.

**Results:** SDR was performed by single level laminotomy at the L2 vertebra level. In all cases, the volume of intersection of the afferent portion of the root was determined under the control of intraoperative neuro-monitoring. A reduction in spasticity according to the MAS by 1 point was achieved in 81 (77.9%) patients, and by 2 points in 20 (19.2%) patients. In patients with CP and scoliotic deformity (n=62), an improvement of 1 point on the MAS was achieved in 50 (80.6%) cases, an improvement of 2 points on the MAS – in 9 (18.9%) cases; and among patients without scoliotic deformity (n=42), 31 (73.8%) showed an improvement of 1 point, and 11 (26.2%) – by 2 points on the MAS. Preoperative spasticity in patients with scoliotic deformity was  $3.4 \pm 0.6$ , and after SDR it significantly decreased to  $2.3 \pm 0.7$ ,  $p < 0.05$ . Spasticity before surgery in patients without scoliotic deformity was  $3.0 \pm 0.6$ , and after SDR it decreased to  $1.7 \pm 0.7$ , which was again statistically significant ( $p < 0.05$ ). According to the Wong-Baker scale, in patients with scoliotic deformity, the pain score was  $7.7 \pm 1.5$  before surgery and  $4.4 \pm 1.3$  after SDR; in patients without scoliotic deformity, the pain score was  $6.9 \pm 1.3$  before SDR and  $3.6 \pm 1.5$  after SDR. In both subgroups, SDR led to a significant reduction in pain ( $p < 0.05$ ). In addition, we assessed maternal sleep quality associated with child anxiety using the Spiegel scale. The number of parent's nighttime awakenings before surgery was  $3.2 \pm 1.36$ , while after surgery it was  $1.33 \pm 0.91$ , indicating a significant reduction ( $p < 0.05$ ).

**Conclusion:** Selective dorsal rhizotomy effectively reduces spasticity, thereby reducing overall pain associated with it, in non-ambulatory patients (GMFCS IV-V). This reduction in pain intensity is reflected in improved sleep for the child and the caregivers (primarily mothers), ultimately improving the quality of life for the entire family.

## Spondylodiscitis: Current Approaches to Diagnosis and Management

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**Introduction:** Spondylodiscitis is an infection involving the intervertebral disc and adjacent vertebral bodies and represents a serious spinal condition associated with significant morbidity and potential neurological complications. The incidence of this condition has increased in recent decades due to population aging, improved diagnostic techniques, and the growing number of immunocompromised patients. Because the clinical

presentation is often nonspecific, diagnosis may be delayed, increasing the risk of spinal instability, epidural abscess formation, and neurological deficits.

**Materials and Methods:** A literature review was conducted to summarize current evidence regarding the epidemiology, clinical presentation, diagnostic strategies, and management of spondylodiscitis. Relevant peer-reviewed studies were analyzed with emphasis on contemporary diagnostic tools and treatment approaches.

**Results:** Persistent back pain is the most common presenting symptom and may be accompanied by fever or neurological deficits in advanced stages. Laboratory findings frequently demonstrate elevated inflammatory markers, including C-reactive protein and erythrocyte sedimentation rate. Magnetic resonance imaging remains the gold standard for diagnosis due to its high

sensitivity in detecting early infectious changes of the spine. Microbiological identification through blood cultures or image-guided biopsy is essential for guiding targeted antimicrobial therapy, with *Staphylococcus aureus* representing the most common pathogen. Conservative management with prolonged antibiotic therapy is the cornerstone of treatment, while surgical

intervention is indicated in cases of neurological compromise, spinal instability, abscess formation, progressive deformity, or failure of medical therapy.

**Conclusion:** Early diagnosis and multidisciplinary management are essential for improving outcomes and preventing complications in patients with spondylodiscitis.

## Каудальные миелодисплазии у детей с нарушением функции тазовых органов

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**Введение:** Основываясь на большой социальной и медицинской значимости нарушения акта мочеиспускания и дефекации, сложном патогенезе аномалий ЦНС, значительно возросших диагностических возможностях, существует необходимость расширения методик в лечении детей с нарушениями функций тазовых органов при миелодисплазии. Сложными остаются вопросы терапии нейрогенных расстройств, поскольку результативность лечения невысока и по различным оценкам колеблется в пределах от 10 до 36.5%.

**Цель:** Разработка методики комплексного лечения детей с нарушениями функций тазовых органов при миелодисплазии.

**Материалы и методы:** Нами проведён анализ 187 детей с каудальной миелодисплазией, включающей 90 детей основной группы и 97 – контрольной группы, находившихся на обследовании и лечении с 2014 по 2025 гг. Локализацией миелодисплазии являлись поясничная и пояснично-крестцовая области.

### Критерии включения:

- Наличие грыжевого анамнеза в пояснично-крестцовой области.
- Жалобы и нарушения нейрогенного характера.

### Критерии исключения:

- Инфицирование грыжевого мешка, развитие менингита, менингоэнцефалита и другие гнойно-воспалительные процессы в нервной системе.
- Тяжёлые сочетанные пороки развития спинного мозга и позвоночника.

В контрольную группу вошли 97 детей с миелодисплазией, которым проведено стандартное обследование и общепринятое лечение без акцента на динамику нейрогенных нарушений.

Методы предоперационного обследования основывались на комплексной оценке состояния

пациента, что предполагало достижение оптимальных результатов при хирургическом лечении миелодисплазии.

**Результаты:** При аномально низком расположении конуса спинного мозга, в случаях его фиксации, всем детям произведена операция, целью которой являлись мобилизация спинальных структур и восстановление нормальных анатомических взаимоотношений в позвоночном канале, улучшение гемо- и ликвороциркуляции. Интраоперационный мониторинг проводился с помощью игольчатых электродов, адаптированных в соответствии с сегментарной иннервацией нижних конечностей. Спинномозговые корешки идентифицировались электростимуляцией биполярным электродом в зоне интереса длительностью стимула 0.1 мс и частотой 2-3 Гц в период основного этапа операции с целью сохранения аномально расположенных структур. В раннем послеоперационном периоде лучше всего восстанавливалась функция тазовых органов. Результаты лечения оцениваются как положительные и обнадеживающие: улучшение тазовых функций у 43.3% оперированных больных.

**Заключение:** Мультидисциплинарный подход, включающий одномоментное реконструктивно-пластическое вмешательство – залог успешного лечения миелодисплазии у детей. Ключевыми факторами успеха являются: слаженная работа команды специалистов, преемственность между этапами лечения и привлечение ресурсов для обеспечения высокотехнологичных методик. Благодаря современным медицинским технологиям, комплексным лечением пациенты даже с такими тяжёлыми дизрафиями могут достичь положительных функциональных результатов, социальной интеграции и активной жизни.

### Выводы:

Анализ клинических данных, результатов нейрорезультативных исследований позволил нам предположить, что в формировании нарушения функции тазовых органов важная роль принадлежит первичным дизрафическим расстройствам, что обосновывает необходимость применения комплекса методов восстановительного лечения.

Необходимо применять высокотехнологичные методы нейровизуализации и нейрорезультативные методы определения и корректировки дальнейшей стратегии лечения у больных с миелодисплазией.

Дальнейшее качество жизни пациентов с миелодисплазией определяется выбором адекватной тактики лечения и анатомической формы порока.

## Хирургическое лечение высоких спинальных дизрафий у детей: прогностически ориентированный подход

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**Введение:** Высокие спинальные дизрафии (шейно-грудной локализации) относятся к редким врожденным порокам развития (1-6.5% всех дефектов нервной трубки) и характеризуются высоким риском прогрессирующего неврологического дефицита. Особенности анатомии данной области, включая высокую плотность проводящих путей и ограниченные компенсаторные возможности, обуславливают сложность диагностики и выбора хирургической тактики.

**Цель:** Оценить эффективность хирургического лечения высоких спинальных дизрафий у детей на основе разработки лечебно-диагностического алгоритма и прогноза исходов.

**Материалы и методы:** Проведён анализ результатов лечения 102 пациентов с шейно-грудной спинальной дизрафией, оперированных в 2015-2025 гг. Основную группу составили 47 пациентов, у ко-

торых применялся разработанный алгоритм, контрольную – 55 пациентов со стандартным и общепринятым подходом. Использованы МРТ, МСКТ с трёхмерной реконструкцией, ЭНМГ и клиническая оценка по шкале неврологического статуса при спинальной дизрафии (SBNS). Разработана модель прогнозирования риска неврологического ухудшения клиники высокой дизрафии.

**Результаты:** Опыт показывает, что высокие дизрафии, в основе которых лежат аномалии развития, прогрессируют с ростом ребёнка более чем в 50% случаев. Применение нашего алгоритма диагностики и лечения позволило улучшить отдалённые функциональные результаты хирургического лечения. В основной группе отмечено снижение частоты чувствительных нарушений на 24.8%, дисфункции тазовых органов – на 13.5%, двигательных нарушений – на 15.3% по сравнению с контрольной группой. Установлена значимая роль структурных факторов (наличие диастематомии I или II типа, протяжённость поражения) и возраста пациента в прогнозе неврологического исхода лечения. Раннее хирургическое вмешательство ассоциировано с более благоприятными результатами в 44% случаев.

**Заключение:** Интеграция клинических, нейровизуализационных и нейрофизиологических данных в рамках прогностического алгоритма позволяет индивидуализировать хирургическую тактику и улучшить долгосрочные результаты лечения. Предложенный подход способствует снижению частоты реопераций на 17% и может быть рекомендован для широкого внедрения в клиническую практику.

## Нейроморфометрия и клиника врождённых спинномозговых грыж

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**Цель:** Изучить клинические проявления врождённых спинномозговых грыж с применением нейроморфометрических исследований.

**Материалы и методы:** На базе РНПЦ нейрохирургии в период 2021-2025 гг. были обследованы 84 больных с диагнозом: Аномалия развития ЦНС: spina bifida. Были изучены их индивидуальные нейроморфометрические характеристики. В качестве контрольной группы дополнительно изучены нейроморфометрические показатели (на основе МРТ, МСКТ) у 20 лиц без врождённой спинальной

патологии и без спинальных неврологических нарушений. Для оценки влияния факторов на клинико-неврологические результаты проводился однофакторный анализ.

**Результаты и обсуждение:** Исследование показало, что при сужении угла отхождения корешков спинного мозга (УОКСМ) на  $10.5-13.5 \pm 2.5^\circ$  от нормы  $64-74 \pm 2.9^\circ$ , у больных отмечается моносистематическая клиническая симптоматика: боли в пояснично-крестцовой области; нарушение функции тазовых органов, нарушения двигательной сферы. При сужении УОКСМ на  $15.3-19.5 \pm 2.5^\circ$  отмечается диссистематическая клиническая симптоматика: боли в пояснично-крестцовой области с нарушениями функции тазовых органов; нарушения двигательной сферы с нарушениями функции тазовых органов. А при сужении УОКСМ на  $\geq 24 \pm 25^\circ$  отмечались боли в пояснично-крестцовой области с нарушениями функции тазовых органов и нарушения двигательной сферы с искривлением позвоночного столба. Наблюдение в динамике и консервативное лечение рекомендовано 18 (21.4%) больным, у которых УОКСМ составлял  $55.7-62.7 \pm 3.4^\circ$  со стабильной клинической картиной с минимальными проявлениями, высоким риском послеопе-

рациональных осложнений, отказа от операции или противопоказаний к оперативному лечению из-за соматических болезней, было рекомендовано динамическое наблюдение у невролога, нейрохирурга и уролога. Консервативное лечение может использоваться для мониторинга симптомов, таких как боли или спастичность мышц. Ведение больных со spina bifida требует многофакторного и персонализированного подхода, который включает в себя регулярное медицинское наблюдение, физическую реабилитацию и поддержку пациентов. В некоторых случаях, когда спинномозговые корешки на снимках МРТ отображаются на нормальном уровне, важно тщательно оценить нейроморфометрические отклонения корешков спинного мозга, которые могут привести к натяжению спинного мозга, что требует своевременного хирургического вмешательства.

### Выводы:

Нейроморфометрический анализ показал, что у здоровых людей угол отхождения корешков спинного мозга на уровне VL2-VL5 составляет  $64-74 \pm 3.4^\circ$ , тогда как у пациентов со spina bifida угол отхождения корешков спинного мозга в данной области меньше ( $49-60 \pm 3.4^\circ$ ), что свидетельствует о наличии синдрома натяжения спинного мозга.

Переменные с уровнем значимости ( $p < 0.001$ ) анализировались с использованием бинарной логистической регрессии. При этом корреляционный коэффициент составил  $r = -0.075$ . Чувствительность данной методики 92.65 %, а специфичность составила 98.5%.

Нейроморфометрический анализ УОКСМ на МРТ снимках играет важную роль в медицинской практике, обеспечивая необходимые данные для детальной диагностики, планирования лечения пациентов.

## Our Clinical Outcomes of Large Myelomeningocele Defects Reconstruction with Rotation-Transposition Fasciocutaneous Flaps

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**Introduction:** Myelomeningocele is one of the most common congenital defects of the CNS, spinal cord, vertebral spine, and overlying skin. Reconstruction of these defects must be performed immediately after delivery to prevent complications.

**Objective:** To determine the versatility and safety of local fasciocutaneous flaps for reconstruction of large myelomeningocele defects in terms of flap survival and dural coverage.

**Materials and Methods:** We present our experience in using local fasciocutaneous flaps with rotational transposition for coverage of skin defects in 62 patients (age: 1 day to 1.5 years, M/F – 35/27) with extensive

myelomeningocele operated on in the Department of Plastic and Reconstructive Surgery of Sourb Astvatsamayr Medical Center between 2012 and 2025. Defect diameters ranged from 6x3 cm to 12x8 cm.

**Results:** The flaps provided sufficient defect closure in all patients. The flap donor sites were closed with primary sutures in all patients. One patient in the double-flap group developed skin necrosis measuring 3x2 cm in the distal portion of the upper midline flap. The necrotic tissue was removed at the second postoperative week, and closure was resumed by re-advancing the local flap. A total of 12 patients experienced marginal superficial necrosis, which subsequently healed secondarily. All remaining flaps healed adequately, and satisfactory results were achieved in all patients. Our technique ensured well-vascularized and tension-free closure without loss of muscle function.

**Conclusion:** Reconstruction of large myelomeningocele defects with local paraspinal fasciocutaneous rotation and advancement flaps is still one of the best choices for closing moderate-to-large defects without using skin graft, without damage to muscle tissue, and the safety of the flaps increases by preserving the perforators. This method provides safe and predictable outcomes and is the method of choice.

## Penetrating Spinal Cord Injury Involving a Palm Tree Thorn: An Exceptional Case Report

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**Introduction:** Penetrating spinal cord injuries (PSCIs) in the pediatric population are rare, comprising less than 10% of spinal trauma cases, with only 4% attributed to penetrating mechanisms. Even more exceptional are cases involving wooden foreign bodies, particularly palm tree thorns. This report presents a rare case of a 9-year-old male with a lumbar PSCI caused by a retained palm tree thorn, highlighting diagnostic challenges, surgical management, and clinical outcomes.

**Materials and Methods:** This is a single-patient case study of a pediatric lumbar PSCI due to a palm tree thorn. The patient was initially managed conserva-

tively following minor skin wounds and back pain. Subsequent imaging using CT and MRI identified two retained wooden fragments. The management included three successive surgeries over several months, with microbiological evaluation and prolonged antibiotic treatment for postoperative infections.

**Results:** The first surgery removed a superficial 3 cm thorn fragment; however, a deeper fragment remained undetected due to intraoperative bleeding. The second presentation, 45 days later, involved a purulent fistula but no neurological deficits. A second surgery was performed with extensive laminectomy but again failed to retrieve the deeper fragment. Cultures were positive for *Acinetobacter*, and the patient received a 35-day antibiotic course. Four months later, the patient

re-presented with recurrent purulent discharge. The final surgery led to the successful extraction of a 2 cm thorn fragment adjacent to the L5 nerve root, followed by CSF leak management and a 21-day antibiotic regimen. The patient recovered fully without neurological impairment and returned to normal life.

**Conclusion:** This case underscores the diagnostic and therapeutic challenges of PSCIs involving atypical wooden foreign bodies in pediatric patients. Complete removal is crucial, as retained fragments can lead to recurrent infections and complications. MRI should be the imaging modality of choice in suspected wooden PSCIs. Aggressive surgical exploration and appropriate antibiotic therapy are key to preventing long-term morbidity and achieving favorable outcomes.

## Результаты селективной дорзальной ризотомии при спастичности мышц нижних конечностей у детей

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**Введение:** Детский церебральный паралич (ДЦП) – одна из ведущих причин детской инвалидизации неврологического профиля. Более чем в 80-90% случаев у пациента диагностируется спастичность. Селективная дорзальная ризотомия (СДР) – нейрохирургический метод стойкого снижения спастичности мышц нижних конечностей, заключающийся в пересечении части чувствительного корешка в целях снижения циркуляции патологического импульса. В настоящем исследовании произведён анализ краткосрочных и долгосрочных результатов СДР.

**Материалы и методы:** На базе нейрохирургического отделения Института Вельтищева в период с 2019 по 2026 гг. произведён ретро- и проспективный анализ 804 пациентов, которым

выполнена СДР. Оперативное вмешательство выполнялось по собственной методике с применением интраламинарного одноуровневого оперативного доступа под нейрофизиологическим контролем. Объем вмешательства определялся клинически, исходя из выраженности и локализации спастичности. Производилась оценка объёмов движений по Тардье в до и послеоперационном периодах, для оценки долгосрочных результатов также применялось анкетирование законных представителей.

**Результаты:** Средний возраст на момент операции составил  $6.8 \pm 3.2$  года. Большинство пациентов относилось к II-IV уровню GMFCS. В послеоперационном периоде отмечалось среднее увеличение объёма пассивных движений на  $12.5 \pm 2.3^\circ$  при отведении бедра, на  $38.2 \pm 5^\circ$  – в подколенном угле, на  $16.7 \pm 3.6^\circ$  при тыльном сгибании стопы. Периоперационных осложнений не наблюдалось. Анкетирование проведено среди 387 пациентов при катамнезе  $8.3 \pm 2$  мес. 87.6% отметили улучшение походки, 93.6% удовлетворены результатами.

**Заключение:** Селективная дорзальная ризотомия – эффективный метод долгосрочной коррекции спастичности. Применение малоинвазивной технологии позволяет нивелировать потенциальные операционные риски при соблюдении принципов ранней активации пациентов.

## Хроническая спинальная стимуляция у детей при нарушениях функций тазовых органов

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**Введение:** Нейрогенная дисфункция мочевого пузыря и прямой кишки представляют собой сложную и нерешённую проблему. Одним из методов терапии нейрогенных нарушений функции тазовых органов (мочевого пузыря и кишечника) разной этиологии (последствий позвоночно-спинномозговая травма [ПСМТ], острого нарушения спинального кровообращения [ОНСК], нейродисплазий) является нейростимуляция. Наиболее частой причиной врождённого нарушения функций тазовых органов является миелодисплазия. Встречаемость до 1 случая на 1000 новорождённых. Приобретённые нарушения часты при ПСМТ, миелитах, нейроде-

генеративных заболеваниях. Имеющиеся методы консервативного и оперативного лечения не всегда позволяют улучшить качество жизни пациента. Спинальная программируемая нейростимуляция применяется при неэффективности других методов лечения и в комплексе реабилитационных мероприятий.

**Материалы и методы:** На базе нейрохирургического отделения РДКБ г. Уфа, Республика Башкортостан, произведена имплантация эпидуральных нейростимуляторов у 32 детей с миелодисплазией и нарушениями функций тазовых органов, прооперированных по поводу:

1. Менингоградикуломиелоцеле (n=6), липоминогоцеле (n=5) и фиксированного спинного мозга, имеющие тазовые нарушения, не поддающиеся комплексной консервативной терапии (всего n=11). Из них, до имплантации нейростимулятора, 6 пациентам с пороками развития проводилась операция по поводу фиксированного спинного мозга.
2. Больные после ПСМТ, ОНСК (n=8).
3. Дети с гиперрефлекторным мочевым пузырём, обследованные урологически и получающие лечение у урологов без эффекта (n=13).

Перед выполнением нейромодуляции пациентам проводились урологические и неврологические исследования. Уровень расположения электродов у больных с тазовыми нарушениями был сакральный (n=11) или грудной и поясничный (n=21).

**Результаты:** Окончательные результаты и их устойчивость во многом зависели от правильного программирования системы. Контроль параметров производился 1 раз в 6 месяцев или по необходимости. У большинства пациентов отмечались положительные результаты, как субъективные, так и объективные.

**Закключение:** Хроническая эпидуральная стимуляция при нарушениях функции тазовых органов – эффективный метод симптоматического лечения нейрогенной дисфункции мочевого пузыря и прямой кишки. Улучшение функций тазовых органов возникает при эпидуральной нейростимуляции и нижегрудного-поясничного, и сакрального уровня. Спинальную программируемую нейростимуляцию можно рекомендовать при неэффективности других методов лечения и в комплексе реабилитационных мероприятий.

## Precision Rootlet Selection in Selective Dorsal Rhizotomy via Crescendo Single-Pulse Stimulation: A Functional Approach to Reducing Spasticity in Cerebral Palsy

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**Background:** Selective Dorsal Rhizotomy (SDR) is a pivotal intervention for children with spastic cerebral palsy (CP). However, the precision of rootlet selection remains a subject of debate. Traditional methods – including dermatome-based approaches and electromyography (EMG) response grading systems – often rely on anatomical assumptions or non-reproducible spreading patterns, which may introduce an element of randomness into the surgical selection process.

**Materials and Methods:** We present a novel intraoperative neurophysiological protocol utilizing crescendo singlepulse stimulation to evoke Compound Muscle Action Potentials (CMAPs). Unlike traditional train stim-

ulation, this method identifies specific dorsal roots that exhibit high responsiveness to spastic triggers. Rootlets are selected for sectioning based on predefined CMAP amplitude thresholds in muscles with preoperatively confirmed spasticity (Modified Ashworth Scale  $\geq 2$ ), ensuring a targeted reduction of muscle tone.

**Results:** Over a series of more than 1,200 procedures, including international cases, this protocol has demonstrated exceptional clinical efficacy and safety. The primary advantage of crescendo single-pulse stimulation is the high reproducibility of the evoked EMG responses. This suggests the existence of stable, functional neuronal circuits between sensory spinal nerve inputs and specific  $\alpha$ -motor neurons in the anterior horn, which are primarily responsible for maintaining pathological muscle tone. By targeting these stable connections, we have achieved significant improvements in motor function with a near-zero rate of surgery-related complications, including sphincter dysfunction.

**Conclusion:** The transition from anatomy-based or pattern-based selection to a functional, reproducible neurophysiological approach allows for unprecedented precision in SDR. This technique minimizes the randomness associated with traditional EMG grading and optimizes postoperative outcomes through the precise interruption of the circuits driving spasticity.

## Posterior Craniocervical and Atlantoaxial Exposure and Instrumentation: Techniques, Biomechanics, and Surgical Considerations

**Brandon Rocque**

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**Introduction:** Posterior craniocervical fixation presents unique surgical challenges arising from the complex biomechanics, neurovascular anatomy, and limited bone stock of the occipitocervical junction. The C0–C1 joint contributes up to 25° of combined flexion/extension and 5° of axial rotation, while C1–C2 accounts for up to 40° of axial rotation – the greatest of any single cervical segment. Early fixation strategies, including onlay bone grafting, methylmethacrylate, and sublaminar wire constructs, provided minimal rigidity and required supplemental halo immobilization, with unacceptably high failure rates. This presentation reviews the evolution of posterior craniocervical instrumentation, with emphasis on modern screw-based fixation techniques and their biomechanical rationale.

**Materials and Methods:** A review of operative techniques and supporting literature is presented, in-

cluding occipital screw fixation, atlantoaxial cable and bone graft constructs, posterior C1–C2 transarticular screw fixation, and C1–C2 segmental fixation. Screw placement strategies at C1 lateral mass, C2 pedicle, and C2 translamina levels are described. Preoperative CT-based planning, intraoperative fluoroscopy, and image-guided navigation are discussed as adjuncts to safe instrumentation.

**Results:** Biomechanical data demonstrate that cervical screw fixation provides superior pullout strength and rotational resistance compared to wire or hook constructs. Occipital screws placed in the midline keel region achieve the greatest pullout strength, while parasagittal screw arrays maximize rotational resistance. Preoperative CT assessment identifies up to 20% of patients with C2 pars interarticularis anatomy unsuitable for transarticular screw placement, with an 18–23% risk of vertebral artery injury in anatomically marginal cases. The Harms C1–C2 segmental technique offers an alternative with reduced vertebral artery risk. C2 translamina screws provide an additional option that avoids the venous plexus and vertebral artery, with a favorable learning curve.

**Conclusion:** Modern posterior craniocervical fixation relies on rigid screw-rod constructs tailored to individual patient anatomy. Thorough preoperative imaging, intraoperative navigation, and familiarity with multiple fixation strategies are essential to optimize stability, minimize complications, and achieve successful arthrodesis across the craniocervical junction.

## Awaiting Delivery: A Critical Appraisal of Fetal Myelomeningocele Closure and the MOMS trial

**Brandon Rocque**

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**Introduction:** Fetal surgery for myelomeningocele (MMC) closure has been hailed as a major advance in the management of open neural tube defects. However, enthusiasm for the procedure predated rigorous evidence, and early non-randomized studies were subject to significant methodological bias – including selection bias, performance bias, detection bias, attrition bias, and reporting bias. Before the landmark Management of Myelomeningocele Study (MOMS) trial, it was not possible to reliably determine whether the perceived benefits of prenatal MMC repair were real or simply a product of study design. This presentation critically examines the evidence for fetal MMC closure, with particular emphasis on the MOMS randomized controlled trial, the magnitude of its reported benefits, and the maternal risks involved.

**Materials and Methods:** The MOMS trial – a multicenter randomized controlled trial comparing prenatal versus postnatal MMC repair – is reviewed in detail.

Outcome measures examined include cognitive development scores, motor function assessed by the FRES-NO scale, and maternal safety data from the MOMS trial and a subsequent international consortium study of 693 mothers with 52 subsequent pregnancies.

**Results:** Prenatal MMC closure demonstrated no significant difference in cognitive outcomes between the two groups (composite mental development scores: 89.0 vs. 87.5). A modest but meaningful improvement in motor function was observed, with FRES-NO scale scores of 93.6% in the prenatal repair group versus 80.5% in the postnatal repair group. However, these functional gains came at a measurable maternal cost. In the international consortium follow-up, 5 uterine ruptures occurred among mothers with subsequent pregnancies, all before 33 weeks gestation, underscoring the long-term obstetric consequences of hysterotomy for fetal intervention.

**Conclusion:** The MOMS trial remains the only randomized controlled trial of fetal MMC closure and provides the most reliable evidence available. Its findings reveal a small motor benefit with no cognitive advantage, while the mother bears meaningful short- and long-term surgical risk. These data should inform careful patient counseling and tempered institutional enthusiasm for fetal MMC repair programs. Critical appraisal of study design and honest assessment of effect size are essential when evaluating emerging fetal surgery techniques.

## Quantitative Analysis of Stimulation Thresholds in Lower-Extremity Associated Sensory Roots (LEASR) during Selective Dorsal Rhizotomy for Spastic Hemiplegia

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**Background:** In Selective Dorsal Rhizotomy (SDR), the variability of stimulation thresholds among sensory roots remains poorly understood. Utilizing a highly reproducible crescendo single-pulse protocol, we investigated whether these thresholds correlate with clinical spasticity and patient demographics.

**Materials and Methods:** A retrospective study was conducted at Shanghai Children's Medical Center on 12 pediatric patients with spastic hemiplegia (median age 7.5 years; range 4–11). Using a crescendo single-pulse stimulation protocol, we identified 187 Lower-extremity Associated Sensory Roots (LEASR). The endpoint threshold was defined as the minimum amplitude re-

quired evoking an EMG response of 200 $\mu$ V in any monitored channel.

**Results:** Stimulation thresholds were significantly lower in three key cohorts:

Age: Children <6 years exhibited lower thresholds than those older than older ones ( $0.80 \pm 0.46$  vs.  $1.19 \pm 0.68$  mA).

Laterality: The affected side showed significantly lower thresholds than the uninvolved side ( $0.77 \pm 0.45$  vs.  $1.15 \pm 0.65$  mA).

Targeting: Rootlets associated with target (spastic) muscles had markedly lower thresholds than non-target rootlets ( $0.58 \pm 0.30$  vs.  $1.13 \pm 0.66$  mA).

Notably, in cases presenting with ankle clonus, the threshold gap widened further, with target muscle rootlets reaching endpoints at only  $0.36 \pm 0.09$  mA compared to  $1.22 \pm 0.85$  mA for non-target roots. Increased EMG noise was also predominantly observed in target muscle channels.

**Conclusions:** These findings demonstrate that spasticity is associated with a significant reduction in the stimulation threshold of corresponding sensory rootlets. This suggests a state of neurophysiological hyperexcitability within the functional neuronal circuits responsible for maintaining muscle tone, providing a potential quantitative biomarker for identifying roots to be sectioned during SDR.

## NEUROTRAUMA

## Симптоматика, диагностика и тактика лечения эпидуральных гематом пациентов детского возраста

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**Введение:** Частота встречаемости эпидуральных гематом (ЭДГ) у детей составляет 2-3% от всех травм головы в педиатрической популяции. Клиническая картина ЭДГ у детей неспецифическая, может отмечаться незначительная симптоматика даже при наличии объёмного воздействия на головной мозг, что затрудняет диагностику и своевременное лечение. Нейрохирургическое удаление ЭДГ проводится наряду с консервативным лечением, однако, показания для консервативного и хирургического лечения окончательно не определены.

**Цель:** Изучить клиническую картину и результаты лечения пациентов детского возраста с ЭДГ.

**Материалы и методы:** В ходе работы проведён ретроспективный и проспективный анализ 184 пациентов детского возраста, проходивших лечение в РНПЦ неврологии и нейрохирургии, по поводу ЭДГ в период с 2015 по 2025гг., из них лиц мужского пола – 112 (60.9%), женского – 72 (39.1%). Возраст пациентов составлял от 1 мес. до 202 мес., медиана возраста – 46 мес.

**Результаты:** Все пациенты при поступлении в стационар оценивались согласно педиатрической шкале ком Глазго (ШКГ), в соответствии с которой, 15 баллов по ШКГ имели 116 (63.0%) пациентов, 13-14 баллов – 42 (22.8%), 9-12 баллов – 18 (9.8%) и ≤8 баллов – 8 (4.4%). В ходе динамического наблюдения отмечено ухудшение уровня сознания по ШКГ в 15 (8.1%) случаях, из них в 2 (1.1%) случаях диагностировано коматозное состояние. «Светлый промежуток» в клинической картине установлен лишь в 3 (1.6%) наблюдениях. Среди жалоб пациентов с

ЭДГ наиболее часто диагностирована рвота в 108 (58.7%) случаях, и головная боль, как локального, так и диффузного характера – 86 (46.7%). Также отмечены жалобы на потерю сознания в 41 (22.3%) случае, наличие поднадкостничной или подпапоневротической гематомы выявили у 80 (43.5%) пациентов. Очаговая неврологическая симптоматика, такая как контралатеральный гемипарез, отмечена в 5 (2.7%) случаях, анизокория в 8 (4.4%), а у 4 (2.2%) пациентов выявлено сочетание данных симптомов. В 1 (0.54%) случае при ЭДГ отмечен генерализованный судорожный приступ. Бледность кожных покровов и слизистых в сочетании с уровнем гемоглобина менее 100 г/л отмечена у 26 (14.1%) пациентов. С целью диагностики ЭДГ всем пациентам при поступлении выполнена компьютерная томография (КТ), по данным которой объём ЭДГ, рассчитанный по формуле «эллипса», был от 0.5 до 138.6см<sup>3</sup>, среднее значение – 19.2см<sup>3</sup>, компрессия базальных цистерн диагностирована у 37 (20.1%) пациентов, а перелом черепа – в 178 (96.7%). КТ-признак «водоворота» при ЭДГ выявлен в 33 (17.9%) случаях. Консервативное лечение ЭДГ проведено 102 (55.4%) пациентам с объёмом гематомы от 0.5 до 30.2см<sup>3</sup>, нейрохирургическое лечение выполнено – 82 (44.6%) пациентам с объёмом гематомы от 9.9 до 138.6см<sup>3</sup>. Повторное хирургическое лечение, связанное с рецидивом ЭДГ, потребовалось в 5 (6.1%) случаях. Среди группы нейрохирургического лечения малоинвазивное удаление ЭДГ проведено 24 (29.3%) пациентам с объёмом гематомы от 10.8 до 100.9см<sup>3</sup>.

**Заключение:** Клиническая картина ЭДГ у пациентов детского возраста неспецифична, а очаговая неврологическая симптоматика диагностирована у 17 (9.2%) пациентов. Консервативное лечение ЭДГ успешно при наличии круглосуточного наблюдения со стороны нейрохирурга ввиду возможного ухудшения неврологического статуса. Своевременное нейрохирургическое удаление ЭДГ, в том числе с использованием малоинвазивных технологий, характеризуется высокой эффективностью и благоприятным прогнозом.

## Acute Subdural Hematoma Resulting from Traumatic Rupture of Dural Arteriovenous Fistula: A Case Report

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**Introduction:** Dural arteriovenous fistulas (dAVFs) are acquired vascular shunts between meningeal arteries and dural venous channels. Though intracranial hemorrhage occurs in fewer than 24 % of cases, subdural hemorrhage presentation is exceedingly rare. Among these, traumatic dAVF rupture leading to acute subdural hematoma (ASDH) is an exceptionally rare neurosurgical entity has very limited documentation.

**Materials and Methods:** We report the case of a 13-year-old boy who presented to the emergency department following a fall from a chair, resulting in a head injury. On arrival, his Glasgow Coma Scale score was 11, necessitating intubation. Non-contrast CT revealed a left ASDH with a moderate midline shift. Due to clinical deterioration, the patient underwent urgent surgery.

**Results:** During surgery, active bleeding was observed from an abnormally dilated venous structure. Further inspection revealed a ruptured dAVF fed by the middle meningeal artery and draining into the sphenoparietal sinus via a diploic vein. Hemostasis was achieved and the fistula was obliterated.

**Conclusion:** Rupture of a dural arteriovenous fistula, although rare, should be considered in cases of ASDH lacking clear traumatic mechanisms such as high-impact injury or bridging vein disruption. In such cases, a vascular imagery should be performed. Prompt surgical evacuation and intraoperative management of the vascular anomaly are essential to optimize neurological outcomes.

## Травмы скуло-орбитального комплекса в челюстно-лицевой хирургической практике

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**Цель:** Сравнить клинические случаи, механизмы травм и степень травматизации в зависимости от механизма, жалобы до операции и их восстановление в послеоперационном периоде. Оценить возникающие осложнения и проанализировать причины их возникновения. Выбрать хирургическую тактику в зависимости от каждого случая травмы и степени смещения перелома. Использовать различные механизмы имплантации и фиксации, сочетать хирургический доступ с предотвращением косметической деформации лица. В зависимости от перелома могут использоваться титановые сетки и пластины, рассасывающиеся мембраны и рассасывающиеся пластины с винтами.

**Материалы и методы:** Пациенты были сгруппированы в зависимости от локализации и типа перелома скуло-орбитального комплекса, механизма их возникновения, хирургического доступа, выбранной хирургической тактики и типа используемых материалов. Пациенты были разделены на 3 основные группы: в первую группу входят пациенты, которым была проведена репозиция смещённых костных фрагментов и пассивная фиксация без использования дополнительных материалов, во вторую группу входят пациенты с использованием титановых пластин и сеток, в третью группу уже

рассасывающие мембраны и пластины. В ходе хирургического и послеоперационного периода оценивалась эффективность используемых материалов и выбранной хирургической тактики, наличие возможных осложнений которые могут возникнуть в будущем, а также восстановление контуров лица в результате контуропластики.

**Результаты:** В первую группу входят пациенты, которым была проведена репозиция смещённых костей и достигнуто удовлетворительное сращение, но которые не были зафиксированы с помощью какой-либо конструкции. У них наблюдается меньше воспалительных процессов в области операции в послеоперационном периоде, но вероятность повторного смещения фрагментов выше, даже при нормальной повседневной активности. Вторая группа включает пациентов, перенёвших операцию с использованием титановых пластин и сеток, у которых иногда наблюдались послеоперационные воспалительные процессы: замедленное заживление ран, образование серозной или гнойной жидкости, требующие повторной ревизии раны. В педиатрической практике недостатком является удаление титановых конструкций после сращения костей во избежание нарушения роста костей в челюстно-лицевой области, в зависимости от возраста ребенка, локализации перелома, а также расположения и количества зафиксированных титановых конструкций. В качестве преимущества следует отметить, что титановые конструкции позволяют добиться более прочной фиксации и навсегда заменить отсутствующие фрагменты. Обширные костные дефекты можно заменить титановой конструкцией, при этом повторное смещение фрагментов в послеоперационном периоде сводится к минимуму. К третьей группе относятся па-

циенты, перенёвшие операции с использованием рассасывающихся конструкций, у которых воспалительные процессы возникают реже, чем при использовании титановых конструкций, так же у них легче добиться рельефности в случае небольших дефектов. Для удаления конструкции не требуется повторная операция. Рассасывающиеся конструкции не препятствуют дальнейшему росту костной ткани в челюстно-лицевой области.

**Заключение:** Методы, тактика и предпочтительные материалы, используемые при хирургическом лечении скуло-орбитального комплекса, определяются на основе изучения травмы каждого пациен-

та, локализации повреждения, степени смещения, возраста пациента и образовавшегося дефекта. Каждый метод фиксации имеет свои положительные и отрицательные стороны. Если мы рассматриваем возможность повторной операции по удалению конструкции, наилучшим вариантом является репозиция и пассивная фиксация с последующим использованием рассасывающихся пластин. Воспаление в области хирургического вмешательства чаще всего наблюдается при фиксации титановыми пластинами, однако наилучшую фиксацию обеспечивают титановые пластины, и уже за ними следуют рассасывающиеся пластины.

## Лечение травмы задней черепной ямки у детей

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**Введение:** Лечение черепно-мозговой травмы с заинтересованностью задней черепной ямки (ЗЧЯ) у детей остается сложной проблемой. В последнее время наметилась тенденция к расширению показаний к консервативной (выжидательной) тактике при травмах ЗЧЯ у детей.

**Цель:** Изучить особенности течения и ведения детей с травмой задней черепной ямки.

**Материалы и методы:** С 2022 по 2025 гг. в отделении нейрохирургии ГИМДКБ на лечении находилось 12 детей с травмой ЗЧЯ. У 11 пациентов степень бодрствования была угнетена до оглушения, один пациент доставлен в коме II. У 10 пациентов диагностирована изолированная ЧМТ, у двух – сочетанная. Повреждения ЗЧЯ проявлялись в виде: эпидуральной гематомы (5 пациентов), субдуральной гематомы (1 пациент), субарахноидального кровоизлияния (5 детей), внутримозжечковых контузионных очагов (3 пациента), вторичного очага ишемии полушария мозжечка по типу ОНМК в вертебробазилярном бассейне (1 пациент). Перелом затылочной кости был выявлен у 5 пациентов, у 2 детей диагностировано расхождение лямбдовидного и затылочно-сосцевидного швов. Пациентам проводилось комплексное обследование, включающее МСКТ (в некоторых случаях и МРТ) головного мозга. Клинические симптомы были обусловлены общемозговой симптоматикой, выявлялись симптомы раздражения коры головного мозга – разнообразные судорожные пароксизмы, симптомы выпадения – глазодвигательные расстройства, двигательные нарушения, стволовая и менингеальная симптоматика. У большинства пациентов с травмой ЗЧЯ в клинике наблюдается фазное течение: после периода относительного благополучия отмечалось ухудшение состояния с симптомами

повышения внутричерепного давления, с болями преимущественно в шейно-затылочной области, светобоязнью и болями при глазодвижениях, ограничением движений в шейном отделе позвоночника, менингеальной симптоматикой, а в некоторых случаях и стволовой симптоматикой. Пациентам проводилась комплексная консервативная терапия, включающая иммобилизацию шейного отдела позвоночника, назначение дегидратационных препаратов, нейроцитопротективная терапия с использованием цитофлавина. В связи с прогрессированием процесса (увеличение очагов контузии, кровоизлияний и развитием окклюзионной гидроцефалии), наличием сдавлением ствола мозга проведены оперативные вмешательства: у двух пациентов выполнено удаление эпидуральной гематомы, у одного наружное дренирование желудочковой системы.

**Результаты:** У детей чаще отмечался подострый тип течения сдавления головного мозга. В динамике у всех пациентов в течение 1–3 недель купировались признаки внутричерепной гипертензии, стволовая и менингеальная симптоматика, а по данным МСКТ/МРТ отмечалось уменьшение очагов контузии, кровоизлияний и устранение блока ликвороциркуляции. На момент выписки из стационара хорошее восстановление (согласно Шкале исходов Глазго) отмечено у 11 пациентов. Послеоперационных осложнений в виде повторных кровоизлияний и воспалительных процессов отмечено не было.

**Заключение:** Своевременная диагностика и адекватное лечение позволяют ограничиться консервативными методами терапии или малоинвазивными хирургическими вмешательствами, такими как наружное дренирование и трепанация черепа с эвакуацией гематомы. В показаниях к хирургии травм ЗЧЯ определяющим является состояние ствола и наличие сдавления ликворопроводящих путей. Необходима адаптация действующих клинических рекомендаций по хирургическому лечению ЧМТ, учитывая возраст ребенка. При травме ЗЧЯ у детей возможно формирование вторичных ишемических очагов. Отмечена важность включения в схемы лечения препаратов с нейропротективным эффектом. Дифференцированный подход в лечении детей с травмой ЗЧЯ позволяет получить хорошее восстановление.

# NEUROPHYSIOLOGY, NAVIGATION AND MAPPING

## Intraoperative Ultrasound Navigation for Precision Drainage of Intracranial Abscesses

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**Introduction:** Intracranial abscesses remain a serious neurosurgical condition requiring timely and precise intervention. Conventional techniques, including stereotactic and freehand aspiration may be limited by brain shift and lack of real-time visualization. Intraoperative ultrasound offers dynamic imaging that can enhance accuracy and safety during abscess drainage. Additionally, uncommon pathogens such as *Gemella morbillorum*, part of the normal oropharyngeal flora, are rarely implicated in brain abscess formation and present unique diagnostic and therapeutic challenges.

**Materials and Methods:** We present a case series of patients with intracranial abscesses managed using intraoperative ultrasound-guided aspiration at our pediatric hospital. Demographic, clinical, radiological, microbiological and surgical data were analyzed. Special attention is given to cases with rare organisms involving *Gemella morbillorum*. All patients underwent burr

hole or mini-craniotomy drainage under real-time ultrasound guidance, enabling precise catheter placement and assessment of abscess evacuation.

**Results:** Intraoperative ultrasound allowed accurate localization of abscess cavities, real-time needle guidance and confirmation of adequate drainage in all cases. Complete or near-complete evacuation was achieved with minimal cortical disruption. No intraoperative complications related to navigation were observed. Clinical improvement was noted in the majority of patients, with low recurrence rates during follow-up. One notable case involved a patient with a solitary brain abscess caused by *Gemella morbillorum*, confirmed via microbiological culture. Intraoperative ultrasound facilitated precise targeting of the lesion, resulting in successful evacuation without neurological deficit. Tailored antibiotic therapy led to full recovery, highlighting the importance of recognizing atypical pathogens.

**Conclusion:** Intraoperative ultrasound navigation is a reliable, safe and cost-effective tool for precision drainage of intracranial abscesses. It enhances surgical accuracy, minimizes invasiveness and allows real-time assessment of treatment adequacy. The inclusion of rare pathogens such as *Gemella morbillorum* underscores the need for thorough microbiological evaluation and individualized management strategies. Intraoperative ultrasound should be considered an essential adjunct in modern abscess surgery.

## Impact of Intraoperative Ultrasound Navigation on Brain Tumor Resection and Functional Outcomes

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**Introduction:** Complete tumor resection while preserving neurological function remains a key challenge in neurosurgery. Intraoperative ultrasound (IOUS) navigation improves the accuracy of tumor boundary delineation, potentially enhancing resection rates and reducing complications.

**Objectives:** To evaluate the impact of IOUS navigation on the extent of brain tumor resection, functional outcomes, and quality of life in the postoperative period.

**Materials and Methods:** This study analyzed clinical and instrumental data from 43 patients with primary brain tumors treated at the Republican Specialized Scientific-Practical Medical Center of Neurosurgery, Tashkent, Uzbekistan, between 2023 and 2024. Patients (aged 19–70, mean age 46.3) were divided into two groups: the main group (n=20) underwent surgery with IOUS navigation (Sonoscape SSI660), enhancing tumor differentiation and brain structure visualization; the control group (n=23) underwent standard surgical resection without IOUS guidance. Radicalism of tumor resection was assessed via multislice CT (MSCT) within 48 hours postoperatively. Functional outcomes were measured using the Karnofsky Performance Scale before and after surgery.

**Results:** The main group achieved a mean tumor resection rate of  $91.5 \pm 12.7\%$ , significantly higher than the control group's  $60.7 \pm 14.3\%$ . IOUS navigation improved tumor boundary identification, increasing resection rates for both low-grade ( $92.5 \pm 4.5\%$ ) and high-

grade ( $80.6 \pm 20.7\%$ ) tumors. On the Karnofsky Scale, the mean functional improvement in the main group was  $+29 \pm 22$  points, with subgroup gains of  $+15 \pm 9$  for low-grade tumors and  $+35 \pm 27$  for high-grade tumors. The control group showed significantly lower improvements ( $+13 \pm 15$ ,  $-12 \pm 19$ , and  $+15 \pm 19$ , respectively), with statistically significant differences between groups ( $p < 0.001$ ).

## The Role of Intraoperative Visual Evoked Potential Monitoring in Sellar Tumor Surgery

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**Introduction:** Location of a tumor in immediate proximity to optic nerves and chiasm, to the formations of III ventricle, and also to internal carotid arteries and their main branches, causes the clinical picture of disease and exclusive complexity of surgical treatment of such patients. Application of monitoring during operation strengthens accuracy and attention of the neurosurgeon that, in turn, gives the early prevention of possible complications with the purpose of revealing of visual infringements before its irreversible damage.

**Objectives:** To estimate the role of intraoperative monitoring of the visual evoked potentials of brain by studying visual functions at tumors of sellar region.

**Conclusion:** Intraoperative ultrasound navigation significantly enhances the radicalism of brain tumor resection and improves functional outcomes. This method reduces the risk of complications associated with tissue damage, leading to better postoperative quality of life. Intraoperative ultrasound navigation is an effective and promising tool in neurosurgical tumor treatment.

**Materials and Methods:** The work is based on results of treatment of 59 patients with tumors of sellar region, which were treated in the Republican Specialized Scientific-Practical Medical Center of Neurosurgery since 2014. All patients were operated via cranial approaches under monitoring of visual evoked potentials.

**Results:** At studying results of research, it has been noted, that the application of intraoperative monitoring of visual evoked potentials decrease the blindness or sharp reduce of visual acuity that is quite often observed at manipulations near optic nerves and chiasm. Long irritation can lead to an ischemia of nerve and the further decrease of visual acuity; hence, at this stage it is necessary to stop manipulations until the normalization of parameters of visual potentials. In our supervision the deterioration of visual acuity in postoperative period was not marked.

**Conclusion:** Intraoperative monitoring of the visual evoked potentials is considered an objective, adequate and most informative method for an estimation of functional condition of structures of the visual analyzer at removal tumors of sellar region.

# NEUROENDOSCOPY AND MINIMALLY INVASIVE NEUROSURGERY

## Neuroendoscopic Lavage: Bridging Surgical and Medical Therapies

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**Introduction:** Neuroendoscopic lavage has emerged as a powerful minimally invasive technique that integrates surgical intervention with targeted medical therapy in the management of complex intracranial pathologies, including intraventricular hemorrhage (IVH), ventriculitis, and parenchymal brain abscesses. By enabling direct visualization and controlled irrigation of the ventricular system, this approach facilitates rapid clearance of blood products, purulent material, and inflammatory debris, thereby reducing intracranial pressure, mitigating secondary injury, and improving cerebrospinal fluid (CSF) dynamics.

**Materials and Methods:** We present our institutional experience with 38 patients, including 20 cases of IVH, 14 cases of ventriculitis, and 4 cases of parenchymal abscesses.

**Results:** In IVH, neuroendoscopic lavage enabled effective clot evacuation and was associated with a reduced need for prolonged CSF diversion. In ventriculitis, the technique provided enhanced source control through removal of infected debris, improving the efficacy of systemic and intrathecal antimicrobial therapy. In selected parenchymal abscesses, particularly those with ventricular extension or close proximity to the ventricular system, endoscopic lavage allowed minimally invasive drainage and cavity irrigation, complementing antibiotic treatment. Technical considerations, including ventricular access, choice of endoscope, irrigation strategies, and perioperative antimicrobial management, will be discussed. Clinical outcomes, complication profiles, and comparisons with conventional approaches such as external ventricular drainage and open surgery will also be presented.

**Conclusion:** By bridging surgical precision with medical therapy, neuroendoscopic lavage represents an effective and evolving strategy in the multidisciplinary management of hemorrhagic and infectious intracranial conditions. Further studies are needed to standardize protocols and optimize patient selection.

## HYDROCEPHALUS

## A Novel Approach to Intracranial Pressure Monitoring with Intraventricular Tunneling in Posterior Fossa Tumors with Hydrocephalus

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**Objective:** Hydrocephalus is a common and clinically significant complication in children with posterior fossa tumors, often necessitating cerebrospinal fluid (CSF) diversion and close intracranial pressure (ICP) monitoring. Conventional strategies may require separate procedures or carry risks of infection and malfunction. We describe a novel technique of intraventricular tunneling that enables simultaneous ICP monitoring and CSF diversion, and evaluate its safety and clinical utility.

**Materials and Methods:** We performed a retrospective analysis of pediatric patients with posterior fossa tumors and associated hydrocephalus who underwent placement of an intraventricular tunneled catheter for combined ICP monitoring and CSF management. Demographic, clinical, and radiological data were collected. Operative details, ICP trends, need for additional CSF diversion procedures, and complications including

infection, hemorrhage, and catheter malfunction were analyzed.

**Results:** A total 16 patients (median age: 7.45 years) were included. Successful placement of the tunneled intraventricular catheter was achieved in all cases. The technique allowed continuous ICP monitoring alongside effective CSF drainage in the perioperative period. ICP data contributed to clinical decision-making, including timing of tumor resection and need for permanent CSF diversion. No procedure-related hemorrhages were observed. The rate of infection was 8.33% (1 case), and no catheter malfunction occurred. Two cases of intraoperative hemorrhage were reported during tumor resection. Two infections were associated with ventilator-associated pneumonia and progressed to meningoencephalitis, ultimately resulting in death. Only 4 patients required ventriculoperitoneal shunt placement during the follow-up period. A subset of patients avoided permanent CSF diversion based on stable ICP trends and compensated hydrocephalus.

**Conclusion:** Intraventricular tunneling represents a feasible and safe approach for combined ICP monitoring and CSF diversion in children with posterior fossa tumors and hydrocephalus. This technique may reduce the need for multiple procedures, provide valuable physiological data to guide management, and decrease the rate of ventriculoperitoneal shunt placement during follow-up. Further prospective studies are warranted to validate these findings and define its role in standard practice.

## Staged Management of Hydrocephalus in Preterm Neonates: Ommaya Reservoir as a Bridging Strategy

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**Introduction:** Neonatal hydrocephalus is one of the most common congenital central nervous system disorders, characterized by impaired cerebrospinal fluid (CSF) circulation, ventricular dilatation, and increased intracranial pressure. The disease affects between 0.3 to 2.5 infants out of every 1,000 births, while it produces high rates of neurological problems in affected children. The main causes of brain damage in preterm babies include bleeding after birth, and subsequent infections that develop in their bodies. Despite advances in management, the optimal timing and type of surgical

intervention remain controversial, particularly in very low birth weight neonates.

**Materials and Methods:** The study analyzed retrospectively 10 preterm neonates with hydrocephalus, primarily of post-hemorrhagic and partially post-inflammatory origin. The lowest birth weight was 600g. Due to the limited role of endoscopic procedures and the inability to perform early shunting, an Ommaya reservoir was used as the first-stage intervention. CSF drainage was performed via reservoir puncture twice daily (or more frequently if required), using a standardized protocol of approximately 1 ml/kg/hour, adjusted per session (multiplied by 12 for twice-daily drainage). Strict time intervals were maintained to minimize intracranial pressure fluctuations. Patients were monitored using neurosonography, with MRI performed prior to definitive treatment.

**Results:** This controlled drainage strategy allowed stable intracranial pressure and prevented pressure fluctuations. CSF sanitation was achieved within approximately one month, during which most patients reached a body weight  $\geq 1500$ g. This enabled safe transition to second-stage ventriculoperitoneal shunt

placement. The approach demonstrated advantages including ease of care, reduced risk of hyperdrainage, and improved patient transportability.

**Conclusion:** A staged approach using an Ommaya reservoir provides effective temporary CSF control

in preterm neonates, allowing safe delay of definitive shunting. This strategy appears to improve management in this high-risk population, though further follow-up is ongoing.

## When the Body Says No: A Rare Case of Rejection of Shunt Material in Pediatric Post-Traumatic Hydrocephalus

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**Introduction:** Ventriculoperitoneal shunting (VPS) remains the cornerstone treatment for post-traumatic hydrocephalus (PTH) in children. Although this procedure has significantly improved outcomes, it is often burdened by complications such as infection, obstruction, migration, and, more rarely, material intolerance. Non-immunological rejection of shunt material – characterized by skin dehiscence and device exposure in the absence of overt inflammatory response – is exceptionally uncommon and poses a major neurosurgical challenge.

**Materials and Methods:** We report the case of a 6-year-old boy born via forceps-assisted delivery, complicated by intraventricular hemorrhage without significant initial ventricular dilation. At 18 months, he presented with progressive psychomotor delay and convergent right eye strabismus. Imaging revealed marked hydrocephalus, and a VPS was placed.

**Results:** Over the next 5 years, the patient underwent 18 surgical revisions involving multiple shunt trajectories – including peritoneal (bilateral), pleural, and even superior sagittal sinus diversion – due to repeated shunt exposure and infection. Remarkably, each episode of shunt exposure occurred without local inflammatory signs: the overlying skin failed to adhere to underlying components, despite appropriate closure and well-healed incisions elsewhere. No immunoallergic reaction was identified through serial testing, ruling out classical hypersensitivity. He experienced multiple episodes of shunt-related meningitis but no peritonitis. Given the failure of conventional sites, a novel intraosseous shunt placement was performed: the reservoir and proximal catheter were embedded in a calvarial canal and covered with epicranial aponeurosis. Six months after surgery, the patient remained clinically stable with no recurrence of exposure or infection.

**Conclusion:** This case illustrates a rare form of shunt material rejection without a proven allergic or infectious mechanism, likely related to a local bio-incompatibility or host tissue integration failure. Conventional strategies including site change, device replacement, and antibiotic-impregnated systems were ineffective. The intraosseous technique provided mechanical protection and improved integration, preventing recurrent extrusion. VPS-related complications in PTH include up to 20-30% infection rates (meningitis, peritonitis), obstruction, and migration; however, repeated aseptic exposure is scarcely documented. This phenomenon raises the need for better understanding of host-implant interactions in pediatric neurosurgery.

## The Little-Known Choroid Fissure Cysts: Pediatric Case Report and Literature Review

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**Introduction:** Choroidal fissure cysts are rare, benign, cerebrospinal fluid-containing lesions typically discovered incidentally during neuroimaging. Although

generally asymptomatic, they may occasionally be associated with non-specific symptoms such as headache, raising questions about their clinical significance.

**Materials and Methods:** We report the case of a 6 years old boy diagnosed with right temporal choroid fissure cyst after being screened for headaches. A brief review of the literature concerning choroid fissure cyst is then performed.

**Results:** We report the case of 6 years-old boy, with no significant past medical history, who presented with recent persistent, non-disabling headaches with occasional vomiting. The headaches were not associated with visual changes, seizures, or other focal neurological signs. Neurological examination was entirely normal. Brain MRI revealed an isolated 15 mm cyst located at the level of the choroidal fissure, with imaging characteristics consistent with a benign arachnoid cyst. No mass effect or hydrocephalus was observed, so a conservative approach was adopted. Since then, the

patient has been followed in our outpatient clinic with regular radiological monitoring.

**Conclusion:** While often considered incidental findings, choroidal fissure cysts may be encountered in patients with chronic headaches. In the absence of neurological deficits or radiological signs of mass effect, conservative management with clinical and radiologi-

cal follow-up remains the standard approach. Discovery of choroid fissure cyst among children has rarely been described in literature. Findings support the benign nature of such cysts and highlight the importance of distinguishing incidental neuroimaging findings from clinically relevant pathology.

## Hydrocephalus after Supratentorial Intraventricular Brain Tumors Removal in Children

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**Introduction:** Intraventricular supratentorial tumors are often associated with obstructive hydrocephalus, which could be related with problems in the postoperative period. The aim of surgery is safe gross total resection of the tumor with histological verification and resolution of hydrocephalus. However, it is not always possible to restore the flow of cerebrospinal fluid.

**Objective:** To investigate the causes of hydrocephalus after intraventricular brain tumors removal in children.

**Materials and Methods:** A retro-prospective study of 123 pediatric patients with supratentorial intraventricular tumors who underwent neurosurgical treatment in the period 2010-2023. The age of the patients ranged from 2 months to 17.9 years, median age was 8.25 years. Tumors removal was performed using two type of approach: transcortical – 52 (42.3%) patients, interhemispheric – 71 (57.7%) patients. We explored parameters such as – preoperative and postoperative hydrocephaly, type of approach, intraventricular hemorrhage, type of resection, obstruction of the cerebrospinal fluid pathways by a residual fragment of the tumor. Univariate statistical analysis was used to identify factors predicting of postoperative hydrocephalus.

**Results:** Preoperative hydrocephalus was diagnosed in 84 (68.3%) of 123 patients. In 80 (95.2%) cases, it was associated with occlusion of the cere-

brospinal fluid pathways and in 4 (4.8%) communicating hydrocephalus. Of the 80 patients with obstructive hydrocephalus, 58 (72.5%) had occlusion in the third ventricle, of which 14 (24.1%) had occlusion at its exit, 22 (27.5%) patients had occlusion of foramen Monro, of which 3 (13.6%) had occlusion of both Monro. The postoperative period in 28 (22.8%) cases develop hydrocephalus, in different times after surgery, from 7 days to 2.7 years, median 48 days. In 26 (92.9%) of the 28 patients, hydrocephalus was diagnosed before surgery. Only 2 (7.1%) patients had de novo hydrocephalus, i.e., without preoperative hydrocephalus, which was communicable and occurred after tumor removal within 7 days and 2.7 years. The persistence of hydrocephalus after surgery was associated with persistent occlusion of the cerebrospinal fluid pathways in 23 (88.5%) of 26 cases. In 4 (17.4%) of the 23 patients, the occlusion was temporary and initially associated with intraventricular hemorrhage, which later develop communicating hydrocephalus. Occlusion of the cerebrospinal fluid pathways by the tumor persisted in 19 (82.6%) of the 23 patients. Thus, postoperative hydrocephalus was diagnosed in 26 (31.0%) of 84 patients with preoperative hydrocephalus and in 2 (5.1%) of 39 patients without hydrocephalus before tumor removal ( $p=0.001$ ). Hydrocephalus after tumor removal developed in 12 (23.1%) cases of 52 which operated with transcortical approach and 16 (22.5%) of 71 operated with interhemispheric. The development of postoperative hydrocephalus was not associated with the type of approach used to remove the tumor ( $p>0.05$ ).

**Conclusion:** Postoperative hydrocephalus develops in different time, from 7 days to 2.7 years. The main cause of hydrocephalus is occlusion of the cerebrospinal fluid pathways by a tumor. Hydrocephaly before surgery is an unfavorable factor. The development of postoperative hydrocephalus did not depend on the type of approach used.

## Хронические формы гидроцефалии у детей

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**Введение:** Гидроцефалия является наиболее распространённым нейрохирургическим заболеванием в детском возрасте. Хронические формы гидроцефалии до сих пор остаются сложно диагностируемым явлением, ввиду стёртой клинической картины зачастую с отсутствием классических клинических и нейровизуализационных признаков внутричерепной гипертензии. Гиподиагностика данных состояний приводит к отсутствию адекватного лечения и ухудшению состояния пациентов.

**Материалы и методы:** На базе нейрохирургического отделения Института Вельтищева было проанализировано с 2023 по 2025 гг. 17 пациентов с хроническими формами гидроцефалии, которым была произведена имплантация ликворошунтирующих устройств. Проанализированы сроки постановки диагноза, этиология, особенности клинической и нейровизуализационной картины.

**Результаты:** Средний возраст на момент операции составил  $1.4 \pm 0.6$  год. У большинства пациентов отмечалось позднее заращение большого род-

ничка без его взбухания, рост окружности головы по верхней границе возрастной нормы, отставание психомоторного развития. В 34.8% вентрикуломегалия диагностирована внутриутробно, у 11.6% детей диагностированы генетические заболевания (ахондроплазия, мукополисахаридоз), у 53.6% этиологическим фактором стало внутрижелудочковое кровоизлияние в неонатальном периоде с формированием сообщающейся и пульсзависимой моно-вентрикулярной гидроцефалии, у одного ребёнка диагностирован порок развития головного мозга в виде лисэнцефалии. У всех пациентов особенностью нейрорадиологической картины служило прогрессирующее в динамике нарастание размеров желудочковой системы с истончением вещества головного мозга.

**Заключение:** Хронические формы гидроцефалии сопряжены с поздней диагностикой и отсроченной имплантацией шунтирующих устройств в связи с медленно прогрессирующими изменениями клинической и нейровизуализационной картиной. Пациенты с выраженной вентрикулодилатацией, развившейся внутриутробно или в неонатальном периоде, а также в результате особенностей течения генетических заболеваний требуют динамического наблюдения нейрохирурга даже при отсутствии ярких признаков внутричерепной гипертензии. При тенденции к нарастанию вентрикулодилатации с компрессией паренхимы головного мозга необходимо проведение шунтирования.

## Гидроцефалия и вентрикуломегалия при spina bifida: патогенез, диагностические критерии и нейрокогнитивные исходы

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**Введение:** Гидроцефалия является одним из наиболее частых и клинически значимых состояний при spina bifida, особенно при миеломенингецеле. В условиях постнатальной тактики лечения необходимость ликворошунтирующих операций достигает 80-90%, что существенно влияет на прогноз и качество жизни пациентов. Внедрение фетальной хирургии позволило снизить частоту шунтирования, однако остаются дискуссионными вопросы патогенеза, интерпретации вентрикуломе-

галии и критериев диагностики клинически значимой гидроцефалии.

**Цель:** Оценить особенности патогенеза гидроцефалии при spina bifida, проанализировать эволюцию диагностических критериев и их влияние на частоту хирургических вмешательств и нейрокогнитивные исходы.

**Материалы и методы:** Проведён анализ клинических и нейровизуализационных данных пациентов с spina bifida после внутриутробной коррекции, включая динамическое наблюдение за размерами желудочков и окружностью головы. Оценка нейрокогнитивного развития проводилась с использованием Шкалы адаптивного поведения Вайнленд (VABS) и шкалы развития младенцев и детей раннего возраста Бейли (Bayley-III).

**Результаты:** Полученные данные свидетельствуют о принципиальной трансформации представлений о гидроцефалии при spina bifida. Внутриутробная коррекция прерывает ключевой патогенетический каскад, связанный с хронической ликвореей и мальформацией Киари II, обеспечивая восстановление ликвородинамического равновесия. В результате у пациентов формируется состояние компенсированной вентрикуломегалии, не сопровождающееся повышением внутричерепного давления и клинической симптоматикой. Данные изменения обуславливают

необходимость пересмотра традиционных диагностических подходов. Установлено, что решающим критерием для определения показаний к ликворошунтирующим вмешательствам является не изолированное увеличение размеров желудочков, а наличие прогрессирующей вентрикуломегалии в сочетании с объективными признаками внутричерепной гипертензии и/или неврологического ухудшения. Применение клинко-ориентированных критериев диагностики позволило добиться значимого снижения частоты ликворошунтирующих операций (3 случая из 44 пациентов), что существенно ниже исторических показателей и отражает уменьшение доли клинически значимой гидроцефалии. Принципиально важно, что изолированная вентрикуломегалия без клинических проявлений не требует хирургического лечения и

может рассматриваться как компенсированное состояние. Анализ нейрокогнитивных исходов показал относительную сохранность когнитивных функций у большинства пациентов. При этом необходимость шунтирования ассоциирована с более низкими показателями адаптивного функционирования, что позволяет рассматривать её как маркер более тяжёлого поражения центральной нервной системы и неблагоприятного функционального прогноза.

**Заключение:** Современные представления о гидроцефалии при spina bifida претерпели трансформацию от морфологической оценки к клинко-функциональной модели. Использование пересмотренных критериев позволяет снизить гипердиагностику и избежать избыточных хирургических вмешательств без ухудшения исходов.

## A Global Health Strategy for Infant Hydrocephalus

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There is an enormous global burden of infant hydrocephalus, with an estimated 80% of the nearly one-half million cases occurring in low- and middle-income countries, nearly half in sub-Saharan Africa. For infants less than 6 months of age, more than half of shunts will fail within 5 years. In areas with limited access to urgent neurosurgical care, shunt-dependence is a life-threatening condition. Endoscopic third ventriculostomy (ETV) offers a good long-term option to avoid life-long shunt

dependence, but its success in young infants is limited. The addition of choroid plexus cauterization (CPC) to the ETV procedure can double the success rate, and shunt-dependence can be avoided in about 2 out of 3 infants. In addition, children who require a shunt due to ETV/CPC failure have recently been shown to have a lower risk of shunt failure at 2 and 5 years than those for whom shunt placement was the primary procedure. Thus, ETV/CPC as the primary procedure may have advantages even when it fails. ETV/CPC as the primary treatment for infant hydrocephalus may currently be the best public health strategy for low-income countries. NeuroKids provides training, equipment, mentorship, and support for diagnosis, patient follow up, and data collection that enables neurosurgeons in those countries to perform ETV/CPC in order to avoid shunt-dependence as much as possible and thus save lives.

## FETAL AND NEONATAL

### Постнатальные исходы внутриутробной коррекции Spina bifida

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**Введение:** Spina bifida является тяжёлой врождённой патологией ЦНС, ассоциированной с развитием гидроцефалии, синдрома Арнольда–Киари II типа, выраженного неврологического дефицита, ортопедических деформаций и нарушений функции тазовых органов. Несмотря на достижения постнатальной хирургии, значительная часть пациентов сохраняет инвалидизирующие последствия. Фетальная хирургия открывает возможность профилактики вторичного повреждения нервной ткани и изменения естественного течения заболевания. Однако оценка эффективности данного подхода требует анализа отдалённых результатов.

**Цель:** Оценить постнатальные и отдалённые исходы внутриутробной коррекции spina bifida и определить её влияние на частоту осложнений и функциональные результаты.

**Материалы и методы:** С 2019 года на базе НМИЦ им. Кулакова совместно с нейрохирургами

Института Вельтищева выполнено 54 внутриутробные операции. Отбор пациенток осуществлялся мультидисциплинарной командой. После рождения дети проходили комплексное обследование и длительное наблюдение с участием нейрохирургов, неврологов, ортопедов и нейроурологов, включая дистанционный мониторинг.

**Результаты:** Под наблюдением находились 44 ребёнка в возрасте от 2 недель до 6 лет 11 месяцев. Полученные данные демонстрируют клинически значимое улучшение исходов по сравнению с естественным течением заболевания. Необходимость ликворошунтирующих операций отмечена лишь у 3 пациентов, что существенно ниже ожидаемых показателей. Синдром Арнольда–Киари II типа регрессировал в 100% случаев по данным МРТ. Частота ранних нейрохирургических осложнений оставалась минимальной (повторное ушивание — 1 случай). Отмечено снижение выраженности неврологического дефицита и улучшение двигательных функций. Более благоприятные показатели адаптивного поведения отмечены у большинства пациентов. Большинство пациентов демонстрировали стабильную положительную динамику, включая улучшение качества жизни и снижение степени социальной дезадаптации.

**Заключение:** Внутриутробная коррекция spina bifida позволяет не только снизить частоту тяжёлых постнатальных осложнений, но и существенно изменить функциональный прогноз заболевания. Полученные результаты подтверждают высокую эффективность метода при условии мультидисциплинарного подхода и непрерывного наблюдения пациентов.

## INFECTION/INFLAMMATORY

## Late-Onset Neonatal Sepsis with Invasive Pneumococcal Neuroinfection and Secondary Staphylococcus aureus Urinary Tract Infection and Soft Tissue Abscess

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**Background:** Neonatal invasive pneumococcal disease caused by *Streptococcus pneumoniae* is rare but associated with substantial morbidity and mortality, particularly with central nervous system involvement. Clinical manifestations may be subtle and non-specific, potentially delaying diagnosis and increasing the risk of severe complications.

**Case Presentation:** A 26-day-old male neonate, born at 37 weeks' gestation via cesarean section following a pregnancy complicated by polyhydramnios, was admitted with fever, poor feeding, weakness, and vomiting. The early neonatal course was uneventful except for jaundice on day 2 of life requiring phototherapy. Laboratory evaluation revealed leukocytosis (WBC  $17.9 \times 10^9/L$ ), elevated C-reactive protein (50.3mg/L), and mild hypoxia requiring supplemental oxygen

without respiratory distress. The neonate developed worsening weakness, sleepiness and central grunting, prompting neurological evaluation. Brain CT was unremarkable. Lumbar puncture was performed, and *Streptococcus pneumoniae* was isolated from cerebrospinal fluid; blood cultures were also positive. Urine culture yielded *Staphylococcus aureus*, consistent with urinary tract infection. Intravenous amikacin and cefotaxime were initiated. During hospitalization, abscesses developed at peripheral catheterization sites, consistent with catheter-associated soft tissue infection. On day 4, a separate fluctuant lesion in the soft tissues over the xiphoid process was identified. Ultrasound confirmed a 14.4×10.7mm partially encapsulated fluid collection. Incision and drainage were performed, and culture confirmed *S. aureus*.

**Discussion:** This case highlights the diagnostic challenge of late-onset neonatal invasive pneumococcal neuroinfection, which remains exceptionally rare in the era of pneumococcal conjugate vaccination and may initially present with subtle, non-specific signs. The coexistence of secondary *S. aureus* urinary tract infection and multiple soft tissue abscesses underscores the potential for multi-site bacterial involvement in vulnerable neonates.

**Conclusion:** Early recognition of subtle neurological and systemic signs, combined with prompt microbiological investigation, imaging, targeted antimicrobial therapy, and timely surgical intervention, is critical to prevent complications and reduce morbidity.

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| Артём Шрамко         | 38; 40         | Лилияна Чугунова  | 38; 40     |
| Василий Бянкин       | 31             | Маргар Мартиросян | 14         |
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| Дмитрий Зиненко      | 25; 38; 38; 40 | Махмуд Ахмедиев   | 22; 23; 23 |
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| Евгений Миронец      | 29             | Нарек Согомонян   | 14         |
| Евгения Бердичевская | 38; 40         | Самвел Саргсян    | 14         |
| Екатерина Смолянкина | 25             | Сардор Каримов    | 23         |
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| Кирилл Костюков      | 38; 40         | Эдуард Петросян   | 14         |

**3<sup>RD</sup> CONGRESS**  
**OF EURASIAN ASSOCIATION OF PEDIATRIC NEUROSURGEONS**  
**EAPN 2026**  
MAY 31 - JUNE 3  
YEREVAN, ARMENIA

**Sunday, May 31, 2026**

|             |                   |
|-------------|-------------------|
| 17:00-18:00 | Opening Ceremony  |
| 18:00-20:00 | Welcome Reception |

**Monday, Jun 1, 2026**

|             |                                     |                                           |             |                        |
|-------------|-------------------------------------|-------------------------------------------|-------------|------------------------|
| 08:30-10:30 | Plenary Session - Oncology          |                                           | 08:30-10:30 | Nursing Symposium      |
| 10:30-11:00 | Tea Break                           |                                           |             |                        |
| 11:00-13:00 | Epilepsy Session                    | Craniosynostosis and Craniofacial Session | 11:00-13:00 | Nursing Symposium      |
| 13:00-14:00 | Lunch Break                         |                                           |             |                        |
| 14:00-16:00 | Critical Care Session               | Infection/Inflammatory Session            | 14:00-16:00 | Nursing Symposium      |
| 16:00-16:30 | Tea Break                           |                                           |             |                        |
| 16:30-18:30 | Flash Oral / Abstract Presentations | AO Spine Symposium                        | 16:30-18:30 | Rehabilitation Session |

**Tuesday, Jun 2, 2026**

|             |                                     |                                                    |             |                   |
|-------------|-------------------------------------|----------------------------------------------------|-------------|-------------------|
| 08:30-10:30 | Plenary Session - Spine             |                                                    | 08:30-10:30 | Nursing Symposium |
| 10:30-11:00 | Tea Break                           |                                                    |             |                   |
| 11:00-13:00 | Neurotrauma Session                 | Neurophysiology, Navigation and Mapping Session    | 11:00-13:00 | Nursing Symposium |
| 13:00-14:00 | Lunch Break                         |                                                    |             |                   |
| 14:00-16:00 | Fetal and Neonatal Session          | Vascular, Functional and Movement Disorder Session | 14:00-16:00 | Nursing Symposium |
| 16:00-16:30 | Tea Break                           |                                                    |             |                   |
| 16:30-18:30 | Flash Oral / Abstract Presentations | Flash Oral / Abstract Presentations                | 16:30-18:30 | Nursing Symposium |
| 19:00-22:00 | Gala Dinner                         |                                                    |             |                   |

**Wednesday, Jun 3, 2026**

|             |                                               |                  |               |                   |
|-------------|-----------------------------------------------|------------------|---------------|-------------------|
| 08:30-10:30 | Plenary Session - Hydrocephalus               |                  | 08:30-10:30   | Nursing Symposium |
| 10:30-11:00 | Tea Break                                     |                  |               |                   |
| 11:00-13:00 | Neuroendoscopy and Minimally Invasive Session | Oncology Session | 11:00-13:00   | Nursing Symposium |
| 13:00-14:00 | Closing Ceremony                              |                  |               |                   |
| 14:00-18:00 | Post-Congress Sessions                        |                  | Social Events |                   |

# III СЪЕЗД ЕВРАЗИЙСКОГО СООБЩЕСТВА ДЕТСКИХ НЕЙРОХИРУРГОВ

## ЕСДН 2026

31 МАЯ - 3 ИЮНЯ  
ЕРЕВАН, АРМЕНИЯ

**Воскресенье, 31 мая 2026г.**

|             |                      |
|-------------|----------------------|
| 17:00-18:00 | Церемония открытия   |
| 18:00-20:00 | Приветственный прием |

**Понедельник, 1 июня 2026г.**

|             |                                              |                                                      |             |                         |
|-------------|----------------------------------------------|------------------------------------------------------|-------------|-------------------------|
| 08:30-10:30 | Пленарное заседание - Онкология              |                                                      | 08:30-10:30 | Симпозиум для медсестер |
| 10:30-11:00 | Перерыв на чай                               |                                                      |             |                         |
| 11:00-13:00 | Сессия по Эпилепсии                          | Сессия по Краниосиностозу и Черепно-лицевой хирургии | 11:00-13:00 | Симпозиум для медсестер |
| 13:00-14:00 | Обед                                         |                                                      |             |                         |
| 14:00-16:00 | Сессия по Интенсивной терапии                | Сессия по Инфекциям/воспалениям                      | 14:00-16:00 | Симпозиум для медсестер |
| 16:00-16:30 | Перерыв на чай                               |                                                      |             |                         |
| 16:30-18:30 | Краткие устные доклады / Презентации тезисов | Симпозиум АО Spine                                   | 16:30-18:30 | Сессия по Реабилитации  |

**Вторник, 2 июня 2026г.**

|             |                                              |                                                                   |             |                         |
|-------------|----------------------------------------------|-------------------------------------------------------------------|-------------|-------------------------|
| 08:30-10:30 | Пленарное заседание - Спинальные патологии   |                                                                   | 08:30-10:30 | Симпозиум для медсестер |
| 10:30-11:00 | Перерыв на чай                               |                                                                   |             |                         |
| 11:00-13:00 | Сессия по Нейротравмам                       | Сессия по Нейрофизиологии, Навигации и Картированию               | 11:00-13:00 | Симпозиум для медсестер |
| 13:00-14:00 | Обед                                         |                                                                   |             |                         |
| 14:00-16:00 | Сессия по Фетальной и Неонатальной медицине  | Сессия по Сосудистым, Функциональным и Двигательным расстройствам | 14:00-16:00 | Симпозиум для медсестер |
| 16:00-16:30 | Перерыв на чай                               |                                                                   |             |                         |
| 16:30-18:00 | Краткие устные доклады / Презентации тезисов | Краткие устные доклады / Презентации тезисов                      | 16:30-18:30 | Симпозиум для медсестер |
| 19:00-22:00 | Гала-ужин                                    |                                                                   |             |                         |

**Среда, 3 июня 2026г.**

|             |                                                       |                     |                        |                         |
|-------------|-------------------------------------------------------|---------------------|------------------------|-------------------------|
| 08:30-10:30 | Пленарное заседание - Гидроцефалия                    |                     | 08:30-10:30            | Симпозиум для медсестер |
| 10:30-11:00 | Перерыв на чай                                        |                     |                        |                         |
| 11:00-13:00 | Сессия по Нейроэндоскопии и малоинвазивным процедурам | Сессия по Онкологии | 11:00-13:00            | Симпозиум для медсестер |
| 13:00-14:00 | Церемония закрытия                                    |                     |                        |                         |
| 14:00-19:00 | Секции после Конгресса                                |                     | Социальные мероприятия |                         |



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