

## The 7<sup>th</sup> National Congress of the Romanian Society of Neurosurgery with International Participation

28 September - 2 October, Cluj Napoca

### ABSTRACTS

#### Undue Effects following Gamma Surgery for Cerebral AVMS

*L. Steiner*

The first AVM managed with the Gamma Knife was by Steiner in April 1970, and up to 2009, he used the procedure in over 2,500 cases of AVMs and dural fistulas in the Department of Neurosurgery, Karolinska Hospital, Stockholm; Clinica Del Sol, Buenos Aires, Argentina; University of Pittsburgh Medical Center, Pittsburgh, PA, and University of Virginia, Charlottesville, VA, USA. In the early stages of our AVM project, patients were subjected to a rigorous protocol of repeated angiograms. Later with the advent of MR1, angiography was not performed until the nidus was no longer visible on MRI performed at six month intervals for two years and then on an annual basis.

Of the more than 2,500 cases, 1,500 Gamma procedures in a total of 1,309 patients with AVMs or fistulae were treated by Steiner at the Lars Leksell Center for Gamma Surgery, University of Virginia, Charlottesville, VA.

The present study aims to analyze the radiation induced imaging changes, venous thrombosis, delayed cyst formation, and secondary tumor occurrence including only the series of patients treated in Charlottesville.

The severity of radiation induced

changes on images and associated neurological deficits varied ranging from asymptomatic, a few millimeters increased T2 signal surrounding the treated nidus to massive brain edema with symptoms and signs of increased intracranial pressure. From 1426 Gamma procedures performed for AVM patients with follow-up MR I available for analysis, 34% of patients developed radiation induced changes. Among them, 58% had mild (a few millimeters of increased T2 signal surrounding the nidus), 34% had moderate (compression of ventricle and effacement of sulci) and 8% had severe (midline shift) radiation induced changes. The mean time to the development of radiation induced changes was 13 months after GKS, and the mean duration of the changes was 22 months. Larger nidus volumes, nidi with a single draining vein and nidi without prior hemorrhage or surgery were associated with a higher risk of radiation induced changes. One hundred and twenty two (8.7%) patients developed headache (33 patients), worsening or new seizures (16 patients) or neurological deficits (73 patients) associated with radiation induced changes. Patients with severe radiation induced changes, nidi at eloquent areas, Mid nidi with prior embolization were more likely to develop symptoms. Twenty six patients (1.8%) had permanent neurological deficits/radiation necrosis.

Twelve patients were found to have early thrombosis of draining veins accompanied with the radiation induced changes/brain edema. The incidence was 1% (12 out of 1256 patients). The venous thrombosis and radiation induced changes occurred 6 to 25 months (mean 13 months) following GKS. Three patients were asymptomatic upon the image findings of venous occlusion and brain edema, three experienced headache, one had seizure and headache and five developed neurological deficits. The radiation induced changes from occlusion of the prominent draining veins tended to be extensive and were more likely to associate with symptoms. Patients with neurological deficits were treated with corticosteroids; two of the patients recovered completely, one still had slight hemiparesis, one had short-term memory deficits, and one died from massive intracerebral hemorrhage. On follow-up images, eight nidi obliterated on angiograms, two obliterated based on MRI, two remained patent.

Cyst formation is a rare complication following GKS. Those developed after resolution of previous hemorrhages or fluid cavities from encephalomalacia after surgeries were not considered as complications related to GKS. From our 1275 patients with follow-up MRI available, we found a total of 21 patients (1.6%) developing a cyst after a mean of 7.9 years post-GKS. Five cysts were found in 702 patients (0.7%) with follow-up shorter than 5 years, eight cysts in 308 patients (2.6%) with follow-up between 5 and 10 years, and another eight cysts in 265 patients (3.0%) with follow-up between 10 and 20 years. Of the 21 patients, 19 had regular MRI follow-up and 15 (79%) of them had radiation induced changes before

the development of cysts. Six patients had large cysts and 3 of them were symptomatic requiring surgery. Two cases underwent craniotomy and drainage of the cyst. The cyst wall showed no evidence of neoplasia.

Two secondary meningiomas in 1275 AVM patients were detected. Follow-up MRI performed over a period of at least 10 years was available in 265 patients. If conservatively estimated that radiosurgically induced secondary neoplasia occurred in two cases during a 2,650 person years or 75 in 100,000 person years, there is a 0.8% chance that a radiation induced tumor may develop within 10 years following Gamma surgery.

### **Microsurgical repair of intracranial aneurysms in the era of endovascular treatment - What is left for microsurgery?**

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*Objective:* Since the advent of endovascular treatment of intracranial vascular malformations including cerebral aneurysms, majority of cases will be treated in this arm of treatment modalities, due to the less invasiveness brought about by avoiding craniotomy. However, considerable number of aneurysms still remain for microvascular repair. This paper do not intend to tackle still persisting controversies in the clip or coil debate, instead it aims to identify and explore the group of cases in the praxis of a busy centre, where neurosurgeons and interventionists work together, and endovascular is the first choice for treatment. Following the above mentioned approach, three major entities

can still be elected for intracranial repair: aneurysms not or less amenable for endovascular treatment, giant aneurysms, and clipping after insufficient obliteration by coiling.

*Methods:* Patient material of our service comprises around two hundred aneurysm cases each year, two third / one third distributed between the endovascular and microsurgical treatment modality. All operated aneurysm patients are worked up within the Budapest Aneurysm Registry, now containing more than five thousand cases.

*Results and surgical strategy: Aneurysms less amenable for endovascular obliteration*

With continuous development of endovascular technologies, virtually all kinds of vascular pathologies can be tackled by this method. Still, if well trained interventionist and surgical teams work together, the pressure to perform is less and those cases can be left for craniotomy which are less favorable for endovascular treatment. Determinants for this group are: localization (e.g. middle cerebral artery bifurcation), and morphology of the aneurysm (wide neck, involvement of bifurcation into the neck, fusiform aneurysms). From surgical point of view, following difficulties need to cope with: sclerotic, stiff neck, rendering calamitous to model the neck appropriately for clipping; if primary vessels virtually offspring from the sack, due to widening of the bifurcation, reconstruction of the bifurcation itself is necessary by clipping; similarly, special challenge to reconstruct normal anatomy by clipping in cases of fusiform aneurysms.

*Giant aneurysms:* Aneurysms with a diameter greater than 2.5 cm comprise this group (Locksley 1966). Frequency of giant aneurysms is around 5-6% with respect to

all aneurysm occurrences, and outcome of untreated cases is rather bleak: 80% lethal or with severe symptoms within five years. They may bleed or are presented with symptoms of a space occupying lesion. The virtually arbitrary limit of 2.5 cm, however, has a profound meaning that may also be considered as definition for giant aneurysms. Considering intracranial geometry (diameter of major vessels, measure of the intracranial space in the surrounding of the aneurysm) this is the size, when due to bulging of the sack, the neck cannot be seen at exposure, regardless the size of craniotomy. From this condition immediately stems the first difficulty during surgery: in order to come close to the neck for clipping, the sack needs to be diminished. Different surgical strategy and technology is necessary to achieve this goal, depending whether the sack is partially thrombosed or not. Proximal control of blood supply is a must (temporary clipping, intracarotid inflatable balloon), and depending on collateral circulation establishment of high-flow venous graft anastomosis before the direct attack on the aneurysm can be useful, as well. Remodeling of the neck either by clipping using special and sometimes big clips or by micro suturing is more often needed than with other aneurysms. Because of the rather difficult and sometimes calamitous surgery inherent with this type of lesions, preoperative knowledge of exact vascular morphology and functional state of circulation is absolute necessary. Modern imaging techniques (3D reconstruction) provides great help.

*Clip after coil:* Even the best endovascular procedure may leave partial filling of the sack, that may increase with time due to the water hammer effect, or perforation and re-

bleeding occurs either at the procedure or later. Although, number of unwanted complications remains a small fraction as compared to the whole number of endovascular procedures, still the frequency of craniotomies increases with the increasing number of endovascular obliterations. From a surgical point of view, when clipping a coiled sack, difficulty stems from the fact, that the packed aneurysm needs to be evacuated, because the rigidly elastic coil material in most cases prevents satisfactory placement of the clip on the neck.

*Conclusion:* It seems, that microsurgical repair still remains an eligible treatment modality, in spite of the preponderance of endovascular techniques. Question is the training for these rather difficult surgical interventions, because, paradoxically the per se more complicated cases are left for microsurgery. Concentrating delicate cases into expert major centers can be the solution in order to assure sufficiently high number of procedures needed to gain appropriate exercise and opportunity for training.

### **Endoscopic assisted surgery in skull base tumours: Results with 282 cases**

***J. Oertel***

The indication for endoscopic assisted surgery in skull bases processes is under controversial discussion. Experienced skull base surgeons often consider the endoscope to be unnecessary while a younger generation of surgeons counts on the value of the endoscope in such procedures. Here, we present our series of endoscope assisted procedures performed since February 2003.

During the investigated time period, a total of 282 skull base cases were operated

on with application of the endoscope. The endoscope was not routinely applied but only when it was felt to be helpful in each individual case. The application of the endoscope was evaluated with respect to the frequency and the duration of the assistance and with respect to the subjective value for the individual surgeon. All patients were postoperatively followed. In all cases, an early postoperative MRI was performed for resection control.

The 285 skull base cases consisted of 128 vestibular neurinomas, 4 trigeminal neurinomas, 20 planum sphenoidale meningiomas, 16 cerebello pontine angle meningiomas, 10 arachnoid cysts, 18 craniopharyngiomas, 14 pineal lesions, 22 aneurysms, 10 hemifacial spasms, 21 trigeminal neuralgias, 8 epidermoids, and 3 others. Overall the endoscope was considered to be helpful in 225 of 282 cases (80%). It was considered to be indispensable in 39 cases (14%). In vestibular neurinomas, the endoscope was used for inspection in 105 cases (82%) and for endoscopic assistance in 23 (18%). The technique was considered to be indispensable in high jugular bulb and deep intrameatal tumour. The endoscope was considered helpful in 93 (73%) and indispensable in 19 (15%). In craniopharyngiomas, the endoscope was used for inspection in fourteen cases (78%) and for endoscopic assistance in 4 (22%). The endoscope was considered helpful in 14 (78%) and indispensable in 4 (22%). One transient oculomotor palsy occurred possibly due to the light source temperature. In hemifacial spasm, the endoscope was used in 100% for inspection and was considered to be helpful in all cases. In aneurysms, the endoscope was applied for inspection in 22 cases (100%). It

was considered to be helpful in 16 (72%) and indispensable in 6 (28%). It was particularly helpful in PCom, BA, and A1 aneurysm surgery to excluded clipping of perforators.

In all, the authors consider endoscopic assistance a valuable tool in selected cases of skull base procedure with being indispensable in a small subgroup of these procedures. Functional results of vestibular schwannoma surgery after radiation treatment Marcos Tatagiba Tübingen, Germany.

*Introduction:* Radiosurgery has been increasingly used as alternative treatment for vestibular schwannomas (VS), particular the small ones. There is a controversial discussion whether radiated VS may be more difficult to be removed because of the fibrous changes caused by irradiation. Aim of this retrospective study war to show the functional results of facial nerve preservation following VS surgery after failed radiation treatment.

*Method:* Among 360 surgical cases of VS, a total of 9 patients had received previous radiation. All 9 patients showed growing tumours at MRI studies. All patients underwent tumour removal via retrosigmoid approach. Postoperative facial nerve results were classified after House-Brackmann grading system.

*Results:* In the total series of 360 VS, complete tumour removal was achieved in 97.8% of the cases, and facial nerve was preserved in 98.5% of the cases. Among the 9 patients with previous radiation, 4 patients had incomplete tumour removal. Postoperative facial nerve was classified as follows: Grade I-II: 4 patients, Grade III: 3 patients, Grade V: 2 patients.

*Conclusion:* Surgical emoval of VS after radiosurgery was shown to be more

difficult than non-radiated cases. Although tumour removal does not necessarily result in facial palsy, there is a significant risk o injury the facial nerve in these cases. Patients who require microsurgical tumour removal need a more conservative approach compared to non-radiated patients.

### **Functional results of vestibular schwannoma surgery after radiation treatment**

***M. S. Tatagiba***

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difficult than non-radiated cases. Although tumour removal does not necessarily result in facial palsy, there is a significant risk of injury to the facial nerve in these cases. Patients who require microsurgical tumour removal need a more conservative approach compared to non-radiated patients.

**Strategies in surgery for anterior skullbase meningiomas: endoscopic or microscopic - endonasal or transcranial?**

*H.W.S. Schroeder*

Endoscopic endonasal skullbase surgery has been increasingly used to approach frontal skullbase meningiomas. The endonasal approach has several advantages compared to the transcranial approach, but also many limitations. Larger meningiomas of the anterior skullbase often involve cerebral blood vessels and olfactory and/or optic nerves. Dissection of these adhesions seems to be safer via a craniotomy than from below. Furthermore, often tumor extensions growing along the dura over the extent expected from preoperative MR imaging is found during surgical exploration.

We use 3 standard approaches for anterior skullbase meningiomas: for large tumors the frontolateral, for medium-sized tumors the supraorbital, and for very small tumors the endonasal approach. Details regarding surgical technique and patient selection are provided.

**Controversies in multimodal management of pineal tumors (Experience of 87 cases)**

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**Background:** Tumor of the pineal region is more common in children (3-8% of Primary Brain Tumours) than in adults (1%). Germ cell tumors (GCT) are dominating in this area, followed by pineal cell tumors, glial tumors and miscellaneous

**Material and method:** The authors reviewed diagnostic problems, management, therapeutical strategies and outcome in 87 cases of pineal area tumors admitted over a period of 15 years (2000 – 2010). The series comprises 51 male and 36 female patients, ranging in age from 0 to 59 years (median age 26 y.o.).

The clinical features were represented by intracranial hypertension (72 cases – 84.7 %), Parinaud syndrome (59 cases – 70.2 %), convergence palsy (18 cases – 21.4 %), ataxia (30 cases – 34.5%), seizures (16 cases – 19 %), endocrine disturbances - precocious puberty (13 cases – 15.4 %), consciousness disturbances (10 cases, 11.9%). Diagnostic evaluation consisted of a medical history, physical & neurological examination, neurodiagnostic findings (CT and MRI scan) and studies of serum and CSF tumor markers. Hydrocephalus was associated in 70 cases (80.4 %). Generally, GCT, ependymomas and pineal cell tumors metastasize easily through the CSF ("drop metastases"). In that situation the all CNS will be evaluated by MRI scan preoperative and postoperative.

**Surgical strategy:** 84 (96.5%) cases were microsurgically approached, via the occipital transtentorial approach (72 cases) (82.7%) or supracerebellar infratentorial approach (12 cases) (13.8%). Three cases

(3.4%) in our data receive stereotactic procedures, followed by neurooncological therapy.

Histological diagnosis has revealed GCT in 40 cases (46%), pineal cell tumors in 16 cases (19 %), glial cell tumors in 27 cases (32 %) and miscellaneous tumors in 4 cases (4,6 %).

Total removal of the tumor was achieved in 22 cases (25.2 %), near total removal in 23 cases (26.4 %), partial removal in 33 cases (37.9 %); open biopsy was undertaken in 8 cases (9,1 %) and stereotactic biopsy in 3 cases (3,4%). Postoperative mortality: four deaths in the first six months (4.8 %). The postoperative complications included: ocular movement disorders (28 cases – 33.3 %), altered consciousness (19 cases – 22.6 %), seizures (18 cases – 21.4 %), ataxia (15 cases – 17.8 %), pupillary abnormalities (15 cases – 17.8 %) and others. The majority of these complications were transient.

Forty-one (47.1%) patients received craniospinal irradiation and two (2.3%) followed focused radiotherapy (G.K.S.). Radiation therapy was done always after the pathological diagnosis. Craniospinal irradiation was administered only to those patients with the disease involving more than one intracranial site, demonstrated meningeal seeding or positive CSF cytology. Chemotherapy (cisplatin & bleomycin & actinomycin D) was received in 43 cases.

The Glasgow Outcome Scale (GOS) at 6 months shows: good recovery 49 cases (56.3%), moderate disability 22 cases (25.2%), severe disability 11 cases (12,6%), persistent vegetative state 1 cases (1.1%), and death 4 cases (4.6%).

*Conclusion:* Pineal tumors represent a therapeutical challenge for neurosurgeons. On the basis of this review, the authors

consider that the outcome depends both by the histological type of tumor and the modality of treatment applied. There is no one surgical approach superior to others, but the stereotactic approach is one of the good and minimal invasive option for obtain enough material for pathological diagnosis. The deep cerebral veins are not a major obstacle for operation in these regions.

*Keywords:* pineal area tumors, MRI, microsurgery, stereotactic biopsy, germ cell tumors and gamma knife surgery

*Abbreviation:* PA = pineal area; PBT = pediatric brain tumors; GCT = germ cell tumors; G.K.S. = gamma knife surgery; G.O.S. = Glasgow outcome scale; CSF = cerebral spinal fluid; CNS = Central Nervous System

### **Endoscopic options in intraventricular tumours**

**J. Oertel, H. W.S. Schroeder, M.R. Gaab**

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Intraventricular lesions represent ideal candidates for neuroendoscopic approaches. Here we present our data since February 1993.

One-hundred-twenty-one lesions consisted of 30 colloid cysts, 28 gliomas, 9 craniopharyngiomas, 5 subependymomas, 9 intraventricular arachnoid, 8 pineal cysts, 5 metastases, 3 glial scars, 3 plexus papillomas, and 18 others. In one case, no histologic diagnosis was achieved. In two cases, only a ventriculitis was found. Follow up was performed up to 9 years.

There was no emergency stopping of any endoscopic procedure. In three cases of colloid cysts venous rebleeding occurred,

and in one case, a switch to microsurgery was done. In two other cases, the endoscopic technique was abandoned because of tumour size, and the tumour resection was continued microsurgically. Mean surgical time scored 90 minutes (range 30 to 240 minutes).

Cystic lesions were evacuated and membranes fenestrated. In three colloid cysts, capsule remnants were left at the roof of the third ventricle. In these three cases, no recurrent growth was observed (FU up to 93 months). A complete resection was performed in small solid tumours in two cavernomas, three plexus papillomas, two medulloblastomas, and one subependymoma. Larger astrocytomas was decompressed. An endoscopic biopsy was performed in 38 cases. CSF flow was restored by 39 ventriculostomies and 9 septostomies. The CSF flow restored in all cases. One meningitis, one permanent mental syndrome, one transient trochlear nerve palsy as well as one transient mental syndrome occurred.

In all, the endoscopic technique represents a safe and effective therapeutic option in intra- and paraventricular lesion. Particularly in association with CSF flow disturbances, neuroendoscopy is an ideal technique for such lesions.

### **Endoscopic versus microsurgical treatment of pineal region tumors**

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*Objective:* Tumors of the pineal region represent a diverse collection of tumors with a variety of natural histories. The authors evaluate their results in the management of patients with tumors in the

pineal region

*Methods:* This is a retrospective clinical evaluation of 14 patients with primary tumors of the pineal region treated by microsurgery and endoscopy. There were 5 pineocytoma, 4 pineoblastomas, 3 low-grade gliomas, one germinoma and one teratoma. There were 8 male and 6 female patients. Their median age was 15.5 years (range 3-49 years). In 1 case the endoscopic procedure represented the only surgical treatment (with total removal of a pineocytoma). In 13 cases, microsurgical removal of the lesions and/or ETV or ventriculo-peritoneal shunts placement were performed for the management of hydrocephalus.

*Results:* All neoplasms were treated surgically with good results. The ETVC was successfully performed without complication in 5 patients and a ventriculoperitoneal shunt was done in four. A total tumor removal was achieved in 9 operations, subtotal in 4 and partial in 1.

*Conclusions:* Early surgical resection combined with ETV or diversion of cerebrospinal fluid is effective in the treatment of pineal lesions. The endoscopic management of patients with pineal region tumors affords a minimally invasive way to obtain resolution of obstructive hydrocephalus by endoscopic third ventriculostomy (ETV and tissue diagnosis) and sometimes can be an only surgical treatment. When a direct microsurgical approach is indicated, the choice among the surgical approaches depends on the size and the location of the lesion in the pineal area and its relation to the ventricular system.



### **Suboccipital supracerebellar approach for pineal region tumors**

*I. Poata, Z. Faiyad, S. Gaivas,  
B. Iliescu, Al. Chiriac*

The rarity of pineal region tumors and repeated changes in their histopathological diagnostic criteria makes the study of their biological behavior and clinical outcomes difficult. Furthermore, the difficulty of preoperative imagistic differential diagnosis imposes a surgical approach to these lesions, including for symptomatic cystic lesions. The deep-seated location of pineal region tumors and their associations with critical structures make their surgical resection technically challenging. We analyze the surgical techniques and results of the suboccipital-supracerebellar approach for pineal region tumors together with the results in the pathological study of these lesions. In our series of pineal region lesions 11 were operated through this approach using prone position. We present the advantages in visualizing the pineal region and its surrounding structures using this approach and the technical challenges and pitfalls. Our experience suggests that the suboccipital-supracerebellar approach provides a good way of access to the pineal region and allows for a good control of the tumor and of the important neighboring structures.

### **Supracerebellar infratentorial approach for pineal region tumors**

*St. I. Florian, H. Stan, Bianca Pinteau,  
C. Pirjol, Andreea Mogyoros*

*Background:* Pineal region tumors represent a heterogeneous group of tumors as origin (at least 17 different subtypes) which are deep-seated, uncommon; tend to

enlarge the gland and be locally invasive; occasionally seed the neuraxis or cause obstructive hydrocephalus or Parinaud's syndrome. They represent about 1% of all brain tumors, but account for 3% to 8% of the intracranial tumors in children. The purpose of this material is to present our experience in treating patients presenting these lesions.

*Material and methods* This review consist in a retrospective study of 25 cases of tumors located in pineal region area, diagnosed and operated in 1st Neurosurgical Department of County Emergency Hospital Cluj-Napoca, January 1998 to June 2010, from a total of 2370 patients with intracranial tumors. From this 25 patients, 24 were surgically treated, one receiving ventriculo-peritoneal shunt followed by radiation therapy with good response.

*Results:* In 18 cases (72%), total removal of the tumor was achieved; 4 cases (16%) underwent subtotal removal and 2 biopsy. Histological features correspond with already published data. Groups marked: pineal parenchymal tumors - 2 cases (8%), glial tumors - 9 cases (36%), germ cell tumors - 3 cases (12%), meningioma 6 cases (24%), metastases 3 cases (12%), and 1 case of tumor with ependymar cells. Gender distributions: 63% female, versus 37% male. Most common presentations were headache, nausea, and vomiting caused by obstructive hydrocephalus, respective Parinaud syndrome, nistagmus, ataxia and dismetrie. In 9 cases (36%) CSF shunting was requested for obstructive hydrocephalus, both preoperative - 6 cases and postoperative - 3 cases; this was achieved either by ventriculocisternostomy: 3 cases or ventriculoperitoneal shunting: 6 cases. Surgical approach was most

commonly infratentorial supracerebellar - 16 cases (64%), and combined infratentorial-occipital transtentorial - 3 cases (12%); subchoroidal approach and endoscopic biopsy were used for the rest of the cases. For almost all cases, we used the sitting position. Complete removal of the tumor was achieved in 18 cases, subtotal in 4 cases; 2 cases was approach by endoscopic biopsy and one case treated only with radiotherapy. Postoperative Karnovsky score was 70 to 100. A single case was noted as deceased, due to acute postoperative cerebellar edema.

*Conclusions:* Infratentorial supra-cerebellar approach was the most commonly used in our series. As well as the occipital transtentorial approach, this allow a relatively easy access to the pineal region and good intra-operative comfort for the surgeon. Malignant tumors should undergo aggressive resection followed by radiotherapy and/or chemotherapy while pure germinomas, which are exquisitely radiosensitive, should be treated by conventional radiother

### **The anatomical and functional spinal balance in vertebral tumors after surgical resection and reconstruction**

**P.P. Varga**

*Aims:* The primary goal of the surgical intervention in primary spine tumor care is to perform „en bloc” resection and obtain tumor-free surgical margins. At the same time, the functional outcome and the quality of life of the patients are highly depends ont he definitive neurological deficits and the possibilities of the soft tissue and bony reconstructions. In this lecture we summaries the basic principles and our institutional policy of the spinal

balance restauration supporting the goals adressed below.

*Materials and Methods:* During the last 12 years we use a complex prospective database of the primary tumors operated int he NCSD. 320 cases are listed, and among them in 205 cases we performed reconstruction after the tumor resection. In this study we analyse the different techniques in different spinal levels, particularly the sacral resections and lumbopelvic reconstructions.

*Results:* In this prospective cohort the best results could be expected from the reconstruction of the entire biomechanical enviroment of the affected segments. Total Segment Resection and Total Sacrectomy gives the best functional results if anterior support and posterior stabilization are applied including proper bone grafting and soft tissue reconstruction (fascia, muscles and skin flaps). Most comon complications are deep wound infection int he early postoperative period and stress failure of the implants for a longer follow up.

*Conclusion:* As a result of the proper oncological resection of the primary spinal tumors often destroys the stability of the affected section of the vertebral coloumn making the functional result of the surgery less favourable. Particularly after sacral tumor resections the neurological deficits should be considered prior the surgery int he planning process of the rehabilitation and the patient consent. Proper data collection and multicentric collaboration could improve the accuracy of the evolution of the long term results after this procedures.

## **Craniocervical stabilization techniques** **M. Zileli**

*Introduction:* Cranio cervical instability may be due to trauma (odontoid fracture, ligamentous injuries, combined C1-C2 fractures), rheumatoid arthritis, congenital abnormalities, tumors and iatrogenic. There are many surgical techniques used for stabilization of the craniocervical junction: odontoid screw fixation, C1-C2 wire fixation, C1-C2 transarticular screw fixation, C1-C2 segmental screw fixation and occipito-cervical fixation.

*Aim:* This paper will summarize the craniocervical stabilization techniques and their results.

*Method:* In a 10 years period we performed 162 upper cervical fixations for instability. The methods we used were occipitocervical fixation (103), C1-C2 wiring (24), C1-C2 screw fixation (20), Halifax clamp fixation (2), odontoid screw fixation (11) and C2-clivus anterior plate fixation (2).

We reviewed the surgical results, fusion rates and complications of these techniques.

*Conclusions:* The anatomy of this region requires attention during all these techniques. Vascular, cranial nerve and spinal cord anatomy have all unique features. To decrease the complication rate and provide solid union, special attention is necessary to biomechanics of this region.

*Keywords:* Craniocervical stabilization, odontoid fracture, occipitocervical fixation, basilar invagination

## **Extensive vertebral resection in spine tumor pathology. Our perspective and experience**

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*Aims:* Spinal instrumentation currently allows gross-total resection and reconstruction in cases of malignancies at all levels of the spine. In the past, the goal of surgery was mainly limited to providing histological diagnosis, neural decompression, and palliation of pain. Now, it is technically feasible to resect tumors completely from all levels of the spine, while simultaneously restoring stability by reconstruction of the resected segments. Our series included those cases in which the surgical management comprised combined approaches, anterior and posterior, associated with instrumentation on several levels. Cases approached only for decompression (without instrumentation) were not considered. Major indications for anterior-posterior resection followed by instrumentation included three-column involvement, high-grade instability, involvement of contiguous vertebral bodies, and solitary metastases.

*Material and method:* We will discuss the results obtained in 92 patients who underwent surgery for primary and metastatic spinal tumors, over a 5-year period (2005-2010) in our department.

The surgical approach was chosen taking into consideration the histological type of tumor and the degree of instability. In order to classify the cases, we used the

instability scale based on the degree of involvement of the three stability pillars (described by Denis). 45 patients were operated through combined anterior and posterior approaches. In 18 cases we performed only anterior approaches (14 cases with tumors located in the cervical region). I did not perform any “en block” resections, only piecemeal resections. In all anterior approaches I was assisted by a general or cardiovascular surgeon.

*Results:* Postoperatively, a significant neurological improvement was recorded in 74 patients. The overall median survival period was 16 months, and 46% of patients survived up to 2 year. 25% suffered postoperative complications.

*Conclusion:* Despite the high incidence of complications, the majority of patients reported improvement in their quality of life at follow-up review. Blood loss was significantly lower in anterior approaches. The outcome is better in the cases where complete resection was possible through combined anterior and posterior approaches. En block resection is superior to piecemeal resection in terms of recurrence risk.

### **Stereotactic management strategies for low-grade gliomas**

***F.W. Kreth***

Supratentorial World Health Organization grade II gliomas constitute a heterogeneous group of neoplasm, some of which are associated with early tumor progression and malignant behaviour. Outcome is powerfully influenced by clinical and molecular-genetic parameters leading to highly divergent outcome measurements independent of any applied treatment strategie: 10 year survival ranges

from as low as 6% to as high as 55%. Accordingly, risk adjusted tailored treatment concepts for well defined subpopulations have increasingly gained influence. Given the fact that only a selected number of these tumors are suitable for complete tumor resection and that the prognostic impact of incomplete resection is not well substantiated, minimal invasive tumor characterization by biopsy might play an essential role for risk adjusted treatment planning of these complex tumor entities.

Here we show that the still new method of molecular stereotactic biopsy technique guided by molecular/metabolic imaging such as positron emission tomography is a safe and powerful tool for tumor characterization in eloquently located gliomas not suitable for complete tumor resection: We demonstrate that the status of important prognostic/predictive biomarkers (such as TP35-, MGMT promoter methylation-, IDH1-, LOH 1p/19q-status) can be reliably and safely obtained using size adjusted molecular-genetic techniques. The success rate of these molecular-genetic analyses lies in the range of > 98%. We further show that the risk of the molecular stereotactic procedure still remains extremely low in experienced hands (< 1%) and is not influenced by tumor location. We further demonstrate that stereotactic Iodine-125 brachytherapy alone or in combination with tumor resection is an attractive treatment concept for selected patients with circumscribed eloquently located glioma. Thus, the modern role of stereotactic techniques for modern management strategies of low-grade gliomas is underscored.

## **Surgery of high grade gliomas – in favor of gross total removal (2010) – personal experience**

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**Background:** Malignant glioma is the most common primary brain tumor in adults. Even with aggressive treatment using surgery, radiation and chemotherapy, median reported survival around one year. In the recent EORTC trial surgery seems to have no prognostic role concerning the survival rate. In the last years more and more studies are focused on the role of surgery in prolonged median of survival and survival at two years. The purpose of this study is to add some arguments in favor of surgery and especially of the radical surgery in malignant glioma.

**Material and Methods:** This is a retrospective study of a single centre single surgeon and represent the the last eleven years of the main author. The study is based 433 cases of high grade cerebral glioma operated between 01.01.2000-01.01.2010 at the Neurosurgical Clinic of Cluj-Napoca University Hospital. All the tumors were operated and total removal was the goal in all the cases. We analyzed age, gender, duration of symptoms, type of surgery, interval from surgery to radiotherapy, total dose received, type of chemotherapy and the correlation of these factors with overall survival.

**Results:** The results shows, according to

their histological features, the following dispersions: astrocytomas grade III (28,4%), glioblastoma multiforme (63,7%), high grade oligodendrogliomas (5%) and high grade ependimomas (2,8%). Age was ranged between 6 to 82 years. Considering de gender, 56,2% were male and 43,8% female. In a clinical point of view increased intracranial pressure was the major sign, followed by motor deficits, language impairment and behavioral changings. Gross total removal of the tumor was achieved in more than 90% of the cases and the mortality was around 3%, large majority of the deceased cases being more than 70 years of age. Data for long term follow up were available for 123 patients.

**Conclusions:** Glioblastoma multiforme is the most frequent type of glioma operated. The most important for a good outcome of the surgical treatment is the extent of resection. Standard treatment for high grade gliomas including gross total removal surgery followed by concomitant radiochemotherapy and adjuvant chemotherapy with Temodal should be considered for all patients. Despite advances in multimodal treatment, the overall prognosis remains poor

**Keywords:** glioma, glioblastoma multiforme, astrocytoma, oligodendroglioma, ependimoma

## **Possibilities and limits in malignant gliomas treatment with the actual therapeutic methods, a retrospective study of 110 cases treated between 2006 and 2009**

**I. Poata, Z. Faiyad, D. Rotariu, S. Gaiwas, B. Iliescu, A. Iencean**

Attempt to complete resection in high grade gliomas are limited by difficulty in

preserving functional structures in the unclear peritumoral infiltrative area as well as deep located vital area with perforator vessels type irrigation. Sacrificing functional areas is not acceptable for lesions well-known for their constant recurrency tendencies. We have analyzed a series of 110 cases of glioblastoma which were operated on between January 2006 and December 2009 using the actual therapeutic methods which include microsurgical resection, intraop echography, neuronavigation, CUSA and awake surgery for eloquent areas. We have excluded the patients without histological confirmation and patients with infratentorial lesions or age under 18.

In our series we have observed a slight predominance in males 55.4 %, the main symptom was the impairment of the motor function observed in 36.3 % cases and seizures in 30.9% cases. The preponderant age group was between 51 and 60 age with 31% of the cases. The complete resection was obtained in 35.4% of cases and in other 61.8% of cases radical surgery was not possible because of the tumor infiltration in basal ganglia in 21.8% of the cases, eloquent areas in 49% of cases and invasion of vascular structures 13.6% of the cases. The main complications in patients operated for GBM was the hemorrhage in the tumoral bed in 13.6% of the cases. We have followed up the patients using MRI examination with contrast enhancement and neurological exam at 2,6 and 12 months postop. The patients were directed to the territorial oncology department for adjuvant therapy (Rxt/Cht), from all of our series only 60 patients have come back for reevaluation and from those only 43 patients have done adjuvant therapy. In 25 patients there was a second operation for recurrence and the average time for re-intervention was 15,6

months.

Early imagistic diagnosis, using high sensitive MRI exams, and complete microsurgical resection seem to improve the outcome of malignant gliomas together with radiotherapy and chemotherapy, but complete cure is difficult to confirm and needs long period of follow-up. Some interesting cases together with our therapeutic and surveillance protocol in glioblastoma are presented.

*Keywords:* glioblastoma, high grade glioma, malignant glioma

#### **Image guided stereotactic biopsy for infiltrative, multicentric and deep-seated cerebral gliomas**

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*Aims:* Despite the recent advances achieved in neuroimaging techniques and microsurgical approaches, the infiltrative cerebral gliomas remain a neurosurgical challenge. In this paper, the authors present their experience in 54 stereotactic biopsies performed for infiltrative, multicentric and deep-seated low-grade and high-grade cerebral gliomas.

*Material and methods:* Fifty-four patients with infiltrative, multicentric and deep-seated gliomas have been enrolled in this study. The median age was 42 years. The stereotactic and neuroimaging tools used for these procedures include the Leksell stereotactic system and the latest software: Stereotactic Planning System (SPS), NTPS 8.2.

*Results:* The histopathological results for these lesions were: 26 cases of grade IV

gliomas (glioblastoma) (48,1%), 8 cases of grade III gliomas (anaplastic astrocytoma) (14,8%), 14 cases of grade II fibrillary astrocytomas (25,9%) and 6 cases of grade I astrocytomas (11,1%). In 8 cases (14,8%) the immunohistochemistry has been performed in order to obtain a more precise histopathological result (for tumor grading).

In this series the mortality was 0%, with no cases of clinical significant hemorrhages after biopsy procedure. Minor bleeding at the biopsy site was revealed by the post-biopsy CT scan in 10 patients (18,5%). Temporary increasing of neurological deficits has been noticed in 6 patients (11,1%).

As soon as the histopathological results have been assessed, the patients have been advised to undergo specific oncological treatment in accordance with the degree of malignancy of the tumors.

*Conclusions:* In conclusion, the image guided stereotactic biopsy represents now a safe method for establishing a precise histopathological diagnosis, which may influence the therapeutically management of the patient.

*Keywords:* Stereotactic biopsy, mass lesions, gliomas

### **Current status of endoscope-assisted microsurgery**

*H.W.S. Schroeder*

Endoscope-assisted microsurgery is a surgical technique which combines the use of the microscope and the endoscope. Both optical tools have advantages and disadvantages. The microscope provides excellent visualization of superficial structures and, more importantly, a stereoscopic view. However, areas behind

bony corners or neurovascular structures cannot be visualized. The endoscope brings the eye close to the area of interest which has advantages in deep and small surgical corridors. Because of the wide-angle optics, the endoscope gives a nice panoramic overview and furthermore, with angulated endoscopes looking and working around a corner is possible. In many skullbase surgeries, the combination of microscopic and endoscopic visualization is helpful. Most of the surgery is done under microscopic view. However, areas which cannot be visualized in straight line with the microscope are approached using the endoscope. In vestibular schwannoma surgery, the endoscope is used to inspect the fundus of the internal auditory canal. In epidermoids which may spread extensively along the subarachnoid spaces, endoscopes aid in inspecting the subarachnoid space in other surgical compartments. Extensions of skullbase meningiomas entering the canals of the cranial nerves, can be removed under endoscopic view.

The endoscope-assisted microsurgical technique enables a safe tumor removal when tumor parts are not visible in a straight line. The need for neurovascular retraction and skullbase drilling can be reduced. Tumor extension into adjacent compartments can be removed via the same approach without enlarging the craniotomy.

### **Best treatment in intracranial arahnoid cysts (ACS)**

*A.V. Ciurea, A. Tascu, D. Talianu, F. Brehar, R. Rizea, A. Spataru*

*Introduction:* Also known as leptomenigeal cysts, arachnoid cysts (ACs) are congenital, benign, nonneoplastic, extraxial, lesion that arise during

development from splitting of arachnoid membrane. Distinct from posttraumatic cysts and unrelated to infection.

Bright (1831) describe the intracranial origin of these lesions, Starkman et al (1958) proposed that the associated temporal hypoplasia is secondary to cyst expansion and pressure on the temporal operculum. According to Di Rocco et al (2010), ACs are developmental defect, that occurs within the first three months of gestational life, in the duplication or splitting of the arachnoid layers, and are related to abnormalities of CSF flow.

*Location:* In 50% intracranial arachnoid cyst involve the Sylvian fissure/middle cerebral fossa. According to Gallasi et al. (1980) Sylvian ACs can be classified into three subgroups according to cysts dimensions and extensions. Other common locations are: CP angle, the quadrigeminal cistern, the retrocerebellar area and the sellar/suprasellar region. Less commonly ACs can develop within the interhemispheric fissure and cerebral convexity.

*Clinical findings:* ACs become symptomatic mainly during childhood and adolescence, depending on the location of the cyst not to its dimension. Asymmetrical macrocranium or a focal bulging of the skull in the temporal region is the most common symptom, headaches, focal neurological symptoms, epilepsy and signs of increased intracranial pressure.

In suprasellar ACs endocrine dysfunctions (60% of cases), hydrocephalus (40% of cases - probably due to compression of the third ventricle) and visual impairment are the most common presenting symptoms.

*Therapeutic options:* Observation - Many authors recommend not treating arachnoid

cysts that do not cause mass effect or symptoms, regardless of their size and location.

Multimodal surgical treatment consisting of shunting the cyst into peritoneum, craniotomy (microsurgery) with fenestration and cystwall excision, endoscopic fenestration or stereotaxic suction.

*Patients and methods:* The authors study 317 cases of arachnoid cysts, admitted in 1st neurosurgical clinic, pediatric neurosurgery department between January 2002-January 2010 (8 years). Admission criteria was: patients diagnosed, treated and followed in 1st Neurosurgery clinic.

*Results:* Localisation of ACs : Sylvian fissure 172 cases(54%), CP angle 38 cases(12%), sellar and suprasellar region 32 cases(10%), pineal area 28 cases(9%), retrocerebellar 28 cases (9%) and interhemispheric 19 cases(6%).

The most common clinical finding was the focal bulging of the skull 62% (196 cases), irritability 51%(162 cases), epilepsy 32%(101 cases) minor focal neurological symptoms 18%(57 cases), cranial nerves palsy 11%(35 cases) and increased intracranial pressure syndrome in 13%(41 cases).

Elected treatment was observation in 40 cases(12,6%), unshunt cysto-peritoneal drainage 162 cases (51,4%), low pressure valve cysto-peritoneal shunt in 20 cases(6,3%). Endoscopic procedure in 31 cases (9,7%) and in 64 cases (20,1%) microsurgical approach with cystwall excision and fenestration.

*Conclusions:* ACs are very frequent congenital cerebral malformation, more than 80% of them are incidental findings being completely asymptomatic.

Treatment is recommended only in



symptomatic ACs by focal neurological deficits, skull deformities, signs/symptoms related to increased ICP and seizures not responsive to medical treatment.

Current series of 317 cases constitute a uniform cohort because cases are diagnosed, treated and followed in a single pediatric neurosurgical service. Choice of treatment was performed very carefully to obtain the best clinical outcome and to reduce the size of the cyst.

*Keywords:* Arachnoid cyst, congenital lesion, temporal hypoplasia, Gallasi clasification, microsurgical fenestration, cystwall excision, endoscopic approach, stereotaxic suction, cyst shunting, symptomatic cyst increased intracranial pressure.

### **Anterior meningo encephaloceles. Techniques and results**

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The authors present their experience concerning anterior meningo-encephaloceles in children.

80 patients, aged 11 months to 18 years, were treated between 1999 and 2009.

75 were native from Cambodia, 5 from Africa (Congo).

The pre operative evaluation was based on clinical data, CT-Scan and/or MRI.

All the operated children presented with a good neurological and cognitive state with an global normal psychomotor development.

The authors detail the surgical techniques:

42 patients were operated through a

double bifrontal and transfacial approach. Most of these procedures were intradural,

38 were operated through a sub fronto orbito nasal approach (SFON) which has the advantage of allowing an epidural and shorter procedure.

The few pathological data we obtained confirmed that the removed tissues were made of gliosis without any neurons in the examined samples.

The post-operative and long term results are detailed:

- mortality: 2 cases (2.5%)
- meningitis: 3 cases, cured by antibiotherapy
- CSF leakage: 4 cases, treated only by lumbar puncture
- Intracranial hypertension due to an arachnoid cyst which was treated by a cysto-peritoneal shunt
- aesthetic results were considered as fine for 77 patients. 3 had to undergo a second procedure for a craniofacial correction.

### **Rare CNS tumors in children**

***J.C. Marchal***

Rare tumors in childhood are either really rare and specific of children or tumors common in adult but rare in childhood. They are made up of 5 clusters of entities:

1. Neuronal, neuronal/glia tumors
2. Pleomorphic xanthoastrocytomas
3. Meningiomas
4. Rare familial syndromes
5. Metastasis

Interestingly, amongst the neuronal, neuronal/glia tumors, gangliocytoma, ganglioglioma, and desmoplastic infantile astrocytomas/gangliomas are quite rare but must be recognized because their diagnosis is difficult and can lead to mistakes for

tumors the prognosis of which is good provided the surgery is undertaken early.

Pleomorphic xantho astrocytomas are responsible for 4% of temporal lobe epilepsy, are theoretically benign but have a risk of anaplastic transformation.

Primitive meningiomas are uncommon in childhood. They have to be separated of the “second tumor” occurring after encephalic radiation therapy.

Amongst the familial tumor syndromes involving the CNS phakomatosis are usual and well known contrary to the Li Fraumeni, Cowden, Turcot and Gorlin syndromes.

Finally the CNS metastases in children occur rarely and have specific primitive cancer location.

### **The anatomy of the white matter of the telencephalon**

**N. Krayenbühl**

*Introduction:* The fiber dissection technique developed by Dr. Klingler in the 1930s in Basel to study the white matter anatomy of the brain has been revitalized in Neurosurgery in the last few years. Due to the advances in neuroimaging with the development of the fiber tracking (DTI) technique, the white matter fiber tracks can nowadays be visualized and influenced the planning in neurosurgical procedures.

*Material and Methods:* The different major white matter bundles of the telencephalon were dissected in anatomical specimens from the medial and lateral aspect and put in correlation with DTI images. The importance and application of the knowledge of this anatomy in planning surgical procedures is analyzed in some clinical cases.

*Conclusions:* With the knowledge of the

white matter anatomy gained by the fiber dissection technique the advances in preoperative planning can be applied more effectively.

### **Surgery for intractable epilepsy in eloquent areas**

**B. Devaux**

Temporal lobe surgery is the most widely used procedure for intractable partial epilepsy – between 60 and 75% of surgical procedures – because of the high frequency of mesial temporal epilepsy as well as excellent outcome, with a seizure relief in 60 to more than 80% of patients. However, in experienced centers, 20 to 25% of patients have their seizures originating from an eloquent area of the brain : sensorimotor region, language areas, occipital and parietal lobes, or insular cortex. In these cases, surgical resection of epileptogenic cortex or lesion is challenging, with a risk of seizures recurrence related to an incomplete resection and a risk of unacceptable postoperative functional deficit.

Over a 15-years period, 89 patients (20,5% of all epilepsy surgery cases) presenting with focal epilepsy of the sensorimotor region (48), language areas (8), parietal or occipital lobes (25) and insula (8), were operated. Preoperative investigations include clinical tests with seizures analysis, video-EEG recordings, high-definition imaging studies, neuropsychological tests and psychiatric assessment. Magnetic resonance imaging was normal in 25 cases (28%). 70 patients underwent depth electrode implantation and seizure monitoring (SEEG) for improved epileptogenic zone identification and surgical planning.

A resection guided with neuronavigation

and cortical/subcortical stimulations was performed in 83 patients and 6 patients underwent multiple stereotactic thermocoagulations. Ten patients were reoperated as a consequence of seizure recurrence.

Neuropathological examination of resected tissue (n=83) revealed an epileptogenic lesion in 73 patients (88%): atrophic scar (11 cases with infantile hemiplegia), focal cortical dysplasia (41), indolent tumors (17), other (4).

Immediate postoperative deficit or worsening was observed in 61 % of patients, 54% of whom recovered within one week to one month. A minor and moderate to severe functional deficit persisted in 20% and 8% of these patients respectively.

With a one-year or more follow-up (mean: 3,6 yrs) in 74 patients, 72% were seizure-free (Engel's Class I). Multivariate analysis found that seizure outcome was significantly correlated to etiology – seizure-free outcome was observed in 93% of patients with a focal cortical dysplasia, while seizure freedom was observed in 40 % only of patients with cryptogenic epilepsy - but no significant correlation with lesion or epileptogenic zone location and seizure outcome was found.

Surgery in eloquent cerebral areas is feasible and allows for excellent seizure outcome and minimal permanent morbidity in most patients harboring an epileptogenic lesion. Functional recovery observed after resection in eloquent regions is related to abnormal organization of functional cortex as well as to mechanisms of functional cortical reorganization.

Careful preoperative investigations ensure identification of epileptogenic cortex or lesion while adequate surgical tools help identifying functional structures and their

preservation.

## **Towards a unified theory in brain lesion and recovery**

***D. Muresanu***

The old concept that neuroprotection means suppressing pathophysiological processes, the idea that a single mechanism molecule might be effective in clinical practice are obsolete today, and represents the root cause of failure.

The effects of etiological agents on the brain traditionally are conceived as a linear sum of independent pathophysiological processes (excitotoxicity, inflammation, apoptosis-like, oxidative stress, etc) generating the pathways of pathological cascades (ischemic, traumatic, neurodegenerative).

The pathway approach has produced a very detailed understanding of molecular changes in the postlesional brain but it possesses blind spots that are critically related to the failure of neuroprotection. This has influenced the simplistic way of understanding the concepts and as well, all attempts at clinical neuroprotection. The idea that a system is a linear sum of its component parts is called "superposition", and the associated approach is called "reductionism".

The failure of clinical neuroprotection, recovery and modifying disease therapies in many chronic conditions, is measuring the failure of the reductionistic approach to the problem.

The pathways can and do interact in a variety of fashions, via cross-talk, positive and negative feedback, etc, but the pathway heuristic itself offers no formal means of understanding such interactions. The expectation of discovering the magic cell

death pathway X has affected experimental designs of neuroprotection studies. The causality demonstrated by the application of the plus/minus strategy is ultimately an illusion. To overcome the limits of the pathway view of cell function, a different approach is needed.

Such an approach is provided by network concepts applied to complex systems.

The bistable model based on these assumptions seems to be a better instrument for a successful translational approach in brain lesion and recovery.

### **Trigeminal neuralgia management. An unsolved subject**

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*Introduction:* More than 100 related references were published in literature this year according to a most recent Pubmed search. From vascular decompression to percutaneous trigeminal ganglion approach including radiofrequency, balloon compression, glycerol injection, even to injection of botulinum toxin A in trigger zone, all those myriade techniques argue for an unsolved standard method. Particular problems rise the postherpetic neuralgias and multiple sclerosis secondary trigeminal neuralgia. The published data are on small or relative small groups of patients, many of them retrospective, with a different follow-up from a center to another. There are only few data on life quality compared pre and postoperative.

*Materials and Methods:* During the last 14 years, there were hundreds of patients

presenting trigeminal neuralgia treated by us. Our policy is direct approach of the cause in case of mass lesion evidence. Radiofrequency at foramen ovale is usually the first step in essential neuralgia, mostly in old patients, followed by neurovascular decompression. Direct hands free foramen ovale approach is the rule. We did not use neuronavigation or CT scan for aiming the target. Instead we count on fluoroscopy and neurophysiology.

*Results:* Our detailed results were presented elsewhere. There were no major complication despite the anatomical challenges for both procedures, radiofrequency and decompression. When compared to others, the results are in range. No suicidal attempt was recorded after surgery. Most of Gasser radiofrequency patients are discharged after no more than 12 to 24 hrs. Postsurgery, the amount of medication is lower but do not cut to null.

*Discussions:* Those techniques proved time efficient. In other words the effects are immediate. Radiofrequency is supraselective when compared to gammaknife, compression and glycerol. Not neglectable at all, radiofrequency is less expensive then others. When compared to "open sky vascular decompression", the risks of radiofrequency are less mainly in cardiac old patients. The abundance of published literature data is mind challenging. It depends on local economical conditions, center size and referral area and last but not least by neurosurgeon training and expertise.

*Conclusions:* Radiofrequency at foramen ovale lesioning in a first intention technique in most of our patients and a unique indication in old cardiac patients. It can be effective in case of second or even third recurrences. Vascular decompression is our

second chronological choice in selected patients.

It is obvious that large prospective randomized multi centric studies are necessary for the next future practice standards.

### **Neurosurgeons perspective on HRQOL following brain damage could we apply QOLIBR, the TBI assessment tool, for tumour patients?**

*K. von Wild*

*Objective:* Today, increasingly more patients will survive even severest brain lesions thanks to modern neurosurgical techniques, neuro-intensive care and early neurosurgical rehabilitation. That, however, might be on the price of long lasting impairments of higher cortical functioning with physical, mental cognitive, and behavioral disabilities causing social restrictions long run. Mental- cognitive and behavioural disabilities are more persistent and constitute more of a handicap than do focal neurological signs. Physical and mental disabilities combine to produce the social or overall outcome and reintegration. GOSE and SF 36 assess only the functional impairment and disability. QOLIBRI has been shown to be able to assess the individuals overall outcome by self assessment for the first time.

*Methods:* Functional impairments after primary, secondary and following brain damage refer to loss of structures and functions. Therefore, disabilities refer to limitations of functioning social restrictions. Functioning is an umbrella term encompassing all body functions, activities and participation. Treatment has to be focused on neuroprotection, brain plasticity, and functional restoration. Acute

neurosurgical care and neurorehabilitation both will need a multidisciplinary team approach. QOLIBRI for TBI can be assessed by self report.

*Results:* QOLIBRI was demonstrated to be the first TBI-specific measure for self assessed HRQoL. It provides information about patients' subjective views of their own lives. It complements traditional measures of disability and recovery (SF 36) by capturing life satisfaction rather than health function while being sensitive to disability and mental health, demographic and socioeconomic factors at the same time. Assessment time 15 min (85%).

*Conclusion:* Obviously the impairment of mental-cognitive and neurobehavioral functioning and not loss of physical skills cause patients' loss of life transactions and final outcome. Main predictors for HRQOL are Depression, Help needed, Health complaints, Anxiety, Disability. This might be also true for tumour and vascular lesions pathology and others in neurosurgery.

### **Cerebrolysin – important neuroprotection therapeutic factor to improve outcome in SBI**

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Traumatic brain injury (TBI) represent a very important cause of disease in all countries. TBI delimitation was performed by Teasdale and Jennett (1974), in Glasgow

Coma Scale (GCS), important standard in the assessment of these brain lesions: minor (13-15), moderate (12-9), severe (8-3). This standard ("golden") scale in TBI was established by motor (1-6p.), verbal (1-5p.), eyes (1-4p.) response at external stimulus. For children (0-16 years) in all hospitals was Children Coma Scale (CCS), also quantification 3-15 points.

Severe brain injuries (GCS 3-8) represent an important cause of mortality and morbidity, especially in patients with active period of life (20-40 years old).

*Material and Method:* Including criteria: the authors studied non selected consecutive 88 patients with SBI (between 6 – 66 years old), 53 male and 35 female in period 2006-2009 (4 years) at the Hospital "Bagdasar-Arseni", Bucharest. The distribution by age was children 30 cases (34,1%) and adults 58 cases (65,9%). The most frequent cause of SBI is represented by the car accidents (car to pedestrian, passenger vehicle) 58 cases (65,9%), followed by falls different higher 23 cases (26,1%) domestic accidents 4 cases (4,5%) and sport traumas 3 cases (3,4%). All intracranial hematomas were operated in the first 6 hours after admission.

Excluding criteria: all patients in SBI status with multiple traumas with or without intracranial hematomas.

All 88 cases were monitoring in intensive care unit (ICU). At admission GCS 3-4 was 26 cases (29,5%), GCS 5-6 was 25 cases (28,4%), GCS 7-8 was 37 cases (42%). In all cases the admission CT scan was performed immediately ; The following CT scan was performed at 24, 48, 72 hours and after 1 week to verified the brain lesion and intracranial mass lesion. In 30 cases (34,1%) intracranial mass lesions undergone to the operative procedures:

extradural hematoma 14 cases (15,9%), subdural hematoma 10 cases (11,3%), intraparenchymal hematoma 6 cases (6,8%). Additional in 10 cases (11,3%) we report penetrated head injury. Also, CT scan showed hemorrhagic contusion 23/88 (26,1%) SAH in 27/88 cases (30,7%), hypodense (ischemic area lesion in 25/88 cases (28,4%), cerebral edema 40/88 cases (45,5%) and DAI 19/88 cases (21,6%); DAI was diagnosis only by MRI and the first week post-injury. In our data surgical evacuation of mass lesions was performed as needed, but only five decompression craniotomy was done. In our study no mortality was registered in the group of ICP < 20 mmHg, all the 28/88 cases (31,8%) which died had the ICP > 20 mmHg.

In the literature there are studies which correlate the GOS with GCS, metabolic, hematological, radiological and clinical profiles.

Important predictor's factors are: Patient age, associated pathology and drugs, transport & hospital facilities, multiple trauma, GC Scale score at admission, CT scan abnormalities and early Neuroprotection & Neurorehabilitation. In our experience the Cerebrolysin is a significant improvement in SBI. Cerebrolysin (mixture of low molecular polypeptide, extracted from pig brain) increase motor function, enhance the cognitive performances, increase memory & attention, improve of brain bioelectrical activity. In all cases, admitted in I.C.U Cerebrolysin –as neuroprotective therapy was early administrated, in the first 24-48 hours. Also early neurorehabilitation represent an important therapeuticall factor in global outcome.

In our data Glasgow Outcome Scale

(GOS): good recovery was in 27 cases (30,68%), moderate disability 13 cases (14,7%), severe disability 22 cases (25%), vegetative state 6 cases (6,8%), death 20 cases (22,7%). At admission GCS 7-8 was preponderant 37 cases (42%) which it was in concordance with the global outcome. The psychological support in all SBI will be necessary to obtain social, familial and professional integration.

The control study (22 cases – GCS: 3-8pct) was realized in the same period; The GOS in control study : good recovery was in 5 cases (22,7%), moderate disability 3 cases (13,6%), severe disability 4 cases (18,2%), vegetative state 2 cases (9,1%), death 7 cases (31,8%).

The statistical comparative data show strong association between Cerebrolysin treatment and global outcome. ( Chi-square test :  $p < 0,001$ )

**Conclusions:** SBI represent an important medical and neurosurgical problem. Many therapeutical factors may improve the outcome in SBI (Early Neuroprotection, Neuroplasticity, Neuroregeneration, Neurorehabilitation and Psychological Support).

**Keywords:** traumatic brain injury (TBI), GCS, severe brain injury (SBI), DAI, ICP, neuroprotection, Cerebrolysin, neurorehabilitation, outcome, GOS.

### **Purified brain proteins and amino - acids (of porcine origin) in the treatment of traumatic brain injuries**

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**Aims:** To assess the benefits of Cerebrolysin treatment for traumatic brain injuries.

**Material and methods:** This is a retrospective study conducted over a period of 5 years.

Between the 1st of January 2004 and the 31st of December 2008 1279 patients were admitted in our Department with close traumatic brain injuries (with no politrauma). For these patients, 14 parameters were recorded: age, sex, GCS (motor, eyes and verbal response), mechanism of injury, symptoms, brain injuries as seen on cerebral CT scan, days of hospitalization, first day of infusion, ml. per day and the outcome at the 10th and the 30th day. The outcome was appreciated using two scales: the Rankin Scale and the Glasgow Outcome Scale (where 1 means good recovery and 5 is death).

Cerebrolysin is a mixture of low-molecular-weight peptides and amino-acids derived from pigs' brain tissue with neuroprotective and neurotrophic properties. The primary indication is for neurological degenerative diseases therapy but it is also used for neural regeneration after traumatic brain injuries.

From these 1279 patients, 184 received perfusion Cerebrolysin. The daily dose of Cerebrolysin was 20 to 30 ml. and the period of time ranged from 5 to 30 days of treatment, during their admission in our Department or after.

The outcome was compared in terms of statistical significance between the patients, who received Cerebrolysin and those who did not received. For statistics we used Epi Info 3.5.1(www.cdc.gov).

**Results:** In the group of patients who did not received Cerebrolysin (with an average GCS at admission time of 11.463) the

average GOS at day 30 was 1.826 while in the Cerebrolysin patients' group (average GCS at admission 10) the outcome average was 1.641. In terms of Rankin Outcome Scale the average values were 1.512, respectively 1.434 for the patients who received Cerebrolysin.

*Conclusions:* Cerebrolysin can be a useful adjuvant drug in the treatment of traumatic brain injuries.

### **Minimal invasive approaches of dorsal spinal canal lesions ventral-located: usefulness of 3D fluoroscopy**

*G. Gambardella, O. Gervasio,  
C. Pecora, A. Fedè*

Lesions in the ventral dorsal spine present considerable difficulties in the surgical treatment for anatomical imperviousness of the access routes. Since about ten years we're using a minimally invasive approach with microsurgical technique, as described in our previous work. To date we have used that technique for treatment of 15 Meningiomas, 4 Neurinomas, 2 small Metastases and 6 Disc Herniations, with better surgical outcome. We therefore support a review of the literature and illustrate the advantages of fluoroscopy with 3D reconstructions on the timing and complexity of surgical procedure, using a Ziehm Vision Vario 3D and a radiolucent operating table, that provide a valuable aid in positioning the fixation and in anatomical planes dissection, much to increase safety and decrease intraoperative risk to the patient.

### **Decision making in cervical spine metastases**

*E. Popescu, B. Costachescu*

Nearly 10% of spinal metastases arise in the cervical region. Breast, lung and prostate cancers are the most common primary tumors that spread to the spine.

The early diagnosis and treatment of metastatic spine tumors is essential to reducing pain, preserving neurologic function, and improving quality of life.

During a 5-year period (2002-2006) we treated a number of 22 patients with metastatic cervical spine tumors. General principles of treatment and results are presented in this paper.

### **The thoracic-lumbar burst fracture – posterior-lateral approach with vertebroplasty “eggshell”**

*D. Serban, Fl. Exergian and collaborators*

*Department of spine surgery of “Bagdasar-Arseni”  
Clinical Hospital of Urgency Bucharest*

Burst fracture is a complex lesion of vertebral column, and the frequency at the level thoracic-lumbar is high. Despite the biomechanical concept that we use, 2 or 3 columns (Holdsworth or Dennis concept), it is difficult to categorize this lesion, and in consequence to apply a treatment that can address to all pathological aspects of this kind of fracture (anterior and posterior column).

With the years the collective of the department of spine surgery of Clinical Hospital of Urgency “Bagdasar-Arseni” Bucharest, has perfected the technique for approaching the burst fracture, reaching at the present form. The technique is a modified posterior-lateral approach, that succeeds to rebuild the fractured vertebral body by a vertebroplasty with poliacrylic cement named “eggshell” with correction of the spine angulation's, to decompress the neurological elements of spine by direct



visual control, to resolve the lesions of fractured neural arch and to assure the reaxetion of spine by short posterior osteosynthesis.

*Aims of study:* to make knowable the technique and to evaluate, clinic and imagistic, the results obtained with this new approach.

*Materials and metods:* We have collected the dates from the casuistic of the department of spine surgery of Clinical Hospital of Urgency “Bagdasar-Arseni” Bucharest on the period July 2009, the beginning implantation’s of the technique, until July 2010. Pre and postoperator, at 6 days and 2 months, it was measured the neurological deficit with the ASIA scale, the degrade angulation’s on simple radiographies, compression’s on vertebral RMN and reconstruction’s of vertebral body on CT.

*Results:* In study was included 37 patients with the burst fractures at the levels T11-L2 of spine. Preoperator all patients have presented neurological deficit ranged from Frankel B to Frankel D, the grade of compression was greater then 30% of anterior-posterior diameter of vertebral canal and that of angulation’s greater then 200. Postoperator all patients were mobilized rapidly and have improved the neurological deficit at 2 months, the correction of angulation’s was realized significantly to all patients and was maintained at 2 months.

*Conclusions:* The technique has proved to be a reliable one, permitting rapidly mobilization of patients, with the favorable results at 2 months to regain the neurological state and anatomic-physiologic, close to normal, status of a functional spine. In the future is necessary to evaluate the efficiency of the technique for a greater follow-up period of time and

to compare with others techniques used to approach burst fracture.

### **Chronic cervical spinal cord injury and bone marrow tissue implant**

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Spinal cord injury (SCI) is a major medical problem worldwide. Spinal cord injuries can lead to paraplegia or quadriplegia and have devastating consequences for victims, families, and society in general. Although there are no fully restorative treatments for spinal cord injury, various rehabilitative and cellular therapies have been tested in animal models. Stem cells are feasible candidates for cell therapy of spinal cord injury. Bone marrow cells are the subject of extensive interest because of their stem cell like characteristics and pluripotency.

There are more data supporting the beneficial effects of bone marrow cells in SCI: bone marrow contains multipotent adult progenitor cells; bone marrow cell transplants improve function recovery and differentiate into neural presursors in animal experiments and bone marrow cell transplants facilitate remyelination of the spinal cord.

We present the experience of two patients with traumatic chronic cervical spinal cord injuries with quadriplegia and the results of the microsurgical resection of the spinal scar and the implant of bone-marrow tissue in the site of the spinal cord lesion.

Each patient underwent a cervical laminectomy to expose the site of the

cervical spinal cord injury and a microsurgical partial resection of the medular scar and implant of autologous bone marrow tissue with a combination of drugs at the site of spinal cord injury. No post-surgery complications occurred. Sensory improvements were noticed, but no significant motor improvements were observed twenty months afterwards.

This is a preliminary study of the autologous bone marrow tissue implant into the lesioned cervical spinal cord. The bone-marrow tissue transplantation procedure has no complications. The post-injury scar's microsurgical partial removal may make the injury site more permeable to the axons attempting to re-grow through. This result is promising, but much follow-up work is needed to document the long-term benefits.

### **Current stage of cell stem implant into traumatic spinal cord scar**

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Spinal cord injury can lead to paraplegia or quadriplegia. Spinal cord injury is heterogeneous and can result from contusion, compression, penetration or maceration of the spinal cord. Spinal cord injury culminates in glial scarring, a multifactorial process that involves reactive astrocytes, glial progenitors, microglia and macrophages, fibroblasts and Schwann cells. The scar is often oriented perpendicular to the neuraxis and appears impenetrable.

The scar of the spinal cord can be:

- a complete and impenetrable glial scar on the site of spinal cord injury,

- an incomplete scar and a post-traumatic syringomyelia or cysts on the site of SCI

- a filiform connective scar of the two segments of damaged spinal cord.

The inability to repair spinal cord damage is attributed to several factors: the presence of inhibitory substances around the lesion, the adult nerve fibres become unable to respond to growth-inducing signals, the formation of cysts at the injury site, the lack of nerve growth factors at the injury site and the formation of scar tissue.

Three therapeutic concepts are currently being envisaged: transplantation of differentiated cells derived from stem cells; direct administration of stem cells to the patient in such a way that they would colonise the correct site of the body; stimulation of endogenous stem cells.

Cellular transplantation after spinal cord injury has several aims: to bridge any scar, cysts or cavities, to replace dead cells and to create a favourable environment for axon regeneration. A variety of adult stem cells have been implanted in animal models of spinal cord injury: olfactory ensheathing cells, bone marrow derived stem cells, cultured spinal cord stem cells etc.

An efficient treatment in spinal cord lesions must combine more main approaches:

- neuroprotection, removing barriers: after the injury the scar tissue gradually fills the damaged area and it is an impenetrable barrier and it does not allow regenerating nerve fibres to pass through, blocking factors which inhibit neural regeneration,

- modulation of inflammatory response following spinal cord injury,

- preventing inhibition of regrowth,

- tissue engineering: biocompatible materials can form a bridge across the

damaged region,

- stimulating and guiding - neurotrophic factors, replacing damaged cells - stem cells therapy

- correctly reconnect the damaged neural circuits inside and outside the spinal cord

A combination of stem cells therapy with neurotrophins is a novel aspect of treatment in spinal cord injury and it will attenuate the neurological damage and could help restore the normal function of spinal cord.

### **The surgical management of gliomas located in functionally eloquent brain areas**

**J.M. Derlon, B. Drouler, E. Olivier**

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*Introduction:* The prognosis of gliomas, either of low or high grades, is improved when a complete or large surgical resection has been performed as a 1st therapeutic step. However, many gliomas – and especially those of grades II or III – are located close to eloquent brain areas, involved in sensory-motor or language functions. In order to remove them with a low risk of post-operative neurological deficit, 3 important conditions must be fulfilled:

- an accurate pre operative neuro imaging assessment, with anatomical and functional imaging;

- a good neuronavigation system;

- and an intra operative electrophysiological management in order to localize functional eloquent areas, and subcortical tracts.

*Material and methods:* Since 1996, we have investigated then operated patients, most of

them having gliomas grade WHO II or III, located in or close to eloquent areas, in the following way: a full anatomical MRI, functional MRI in all cases of glioma close to language areas, and a few of those close to motor areas, and orthophonic and neuropsychological assessment when necessary.

Anaesthesia depended about the functional area which was threatened : general anaesthesia was allowed for monitoring the motor function, but should be performed without curare ; but local anaesthesia is imperative for monitoring the language function, when functional MRI has shown activation close to the tumor. The main intra operative complication of the stimulation was the occurrence of seizures, a risk which may be lowered by using a monopolar instead of a bipolar stimulating electrode, in the case of motor monitoring, and controlled by irrigating the cortex with iced serum.

*Results:* This management allowed large or subtotal tumour removal in about 80% of the patients, with a low rate of permanent neurological disorder, and long survival without recurrence.

*Conclusion:* When a glioma is located in or close to a cortical eloquent brain area, it should not be considered as a candidate for only needle biopsy, but carefully investigated and managed for a large removal.

### **Prognostic genetic markers in malignant gliomas**

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Glioblastomas are the most frequent and malignant brain tumors in adults. Surgical cure is virtually impossible and despite of radiation and chemotherapy the clinical course is very poor. Epigenetic silencing of MGMT has been associated with a better response to temozolomide-chemotherapy. We previously showed that temozolomide increases the median survival time of patients with tumors harbouring deletions on 9p within the region for p15(INK4b), p16(INK4a), and 10q (MGMT).

The aim of this study was to investigate the methylation status of p15, p16, 14ARF and MGMT in glioblastomas and to correlate the results with the clinical data.

Only patients with KPS > 70, radical tumor resection, radiation and temozolomide-chemotherapy after recurrence were included.

We observed promoter methylation of MGMT in 56% (15/27) and of p15 in 37% (10/27) of the tumors, whereas methylation of p16 and p14ARF were rare.

Interestingly, methylation of p15 emerged as a significant predictor of shorter overall survival (16.9 vs. 23.8 months,  $p=0.025$ ), whereas MGMT promoter methylation had no significant effect on median overall survival under this treatment regimen (22.5 vs. 22.1 months,  $p=0.49$ ). In the presence of other clinically relevant factors, p15 methylation remains the only significant predictor ( $p=0.021$ ; Cox regression).

Although these results need to be confirmed in larger series and under different treatment conditions, our retrospective study shows clear evidence that p15 methylation can act as an additional prognostic factor for survival and underlines that this tumor suppressor, involved in cell cycle control, can act as an attractive candidate for therapeutic approaches in glioblastomas.

### **The role of intraoperative cerebral echography**

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*Objective:* The intraoperative cerebral ultrasonography can be used to localize brain lesions, their relationships with the surrounding neurovascular structures, the grade of vascularization, the extent of the surgical resection and the existence of any possible postsurgical complications.

*Materials and methods:* In our study we used a Siemens Sonoline Sienna 3.5 MHz (sectorial transducer)/5 MHz (linear transducer), pulsed and color Doppler ultrasound in B-mode to evaluate 30 patients diagnosed with different brain tumors. There were 17 males and 13 females with various supratentorial lesions (meningiomas, astrocytomas, glioblastomas, metastasis, vascular malformations, dermoid cyst, lymphomas, tuberous sclerosis, intracerebral hemorrhage and cerebral ischemia). Analysing the echographic images we were able to detect the tumor site, to see its echogenicity and to control the margins of resection.

*Results:* With intraoperative cerebral sonography we were able to identify and

localize the brain tumors, to assess the blood supply of the lesion and the relations with the nearby anatomy and to verify the extent of tumor removal.

*Conclusions:* The real-time intraoperative cerebral ultrasound is a complementary examination and brings important information that can enhance the surgical outcome.

### **Induction of differentiation inhibits the tumorigenic potential of glioblastoma cancer stem cells**

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*Aims:* Isolation and characterization of cancer stem cells (CSCs) from human glioblastoma opened new perspectives in primary brain tumors research and offered an alternative experimentally approach for this severe disease. The authors of this study successfully inhibited the tumorigenic potential of CSCs isolated from glioblastoma samples, using a combination of differentiation induction factors.

*Material and Methods:* Tumors from patients with confirmed glioblastoma multiforme (GBM) were mechanically and enzymatically dissociated and grown in neural stem cell expansion medium to generate neurospheres (DMEM supplemented with 10-20ng/ml FGF; 10-20 ng /ml EGF; 1x B27; 1xN2). The in vivo tumorigenic potential of glioblastoma cell cultures (neurospheres) was assessed by intracranial injection of glioblastoma-derived csc into the right striatum of CD1 nude mice. Then, induction differentiation factors like BDNF, NT-3 and trans-retinoic acid have been added in CSCs cultures. The changes in stem cell markers,

matrixmetalloproteases, cadherins and Notch pathway expression have been assessed. CSCs exposed to the differentiation factors have been inoculated in nude mice and their tumorigenic potential has been evaluated.

*Results:* Some of the initiated cultures formed the free-floating structures generated by these cells in vitro, the "neurospheres", considered to be a characteristic feature of tumor neural stem cell, which were morphologically and functionally heterogeneous. The authors of this study successfully developed tumor xenografts in nude mice using these primary cultures. The using of serum-free culture for selection (neurosphere assay) allowed the selection of CSCs containing subpopulation that were able to reproduce original tumour aspect in orthotropic xenografts. The expression of genes regulating neurogenesis on Notch pathway (DLL1, DTX1, HEYL, JAG1, NEURL, NOTCH2, PAX5) were increased from 1.5 to 6 times. The stemness biological feature was correlated with increased of same metalloproteases, cadherins, catenin and with tumour contra-lateral invasion. The expression of stem cells markers, metalloproteases and cadherins decreased after exposure of the CSCs cultures to the differentiation induction factors. In vivo experiments demonstrated also the inhibition of tumorigenic potential of CSCs cultures exposed to the differentiation factors.

*Conclusions:* Serum-free culture allowed the selection of a subpopulation containing CSCs with increased tumorigenic potential. CSCs cultures showed a decrease in the expression of stem cells markers and lost their tumorigenic potential, when they were exposed to a specific combination of differentiation induction factors.

**Malignant transformation of low grade gliomas into glioblastoma a series of 10 cases**

**D. Rotariu, S. Gaivas, Z. Faiyad, D. Haba, B. Iliescu, I. Poata**

Low-grade gliomas of the central nervous system constitute 15 to 35% of primary brain tumors. Although this category of tumors encompasses a number of different well-characterized entities, low-grade tumors constitute every tumor not obviously malignant at initial diagnosis. We present a series of 10 cases of low grade astrocytomas, confirmed by histological exam, operated between 2006 and 2009 which have suffered malignant transformation into glioblastomas during postop surveillance. The average time of transformation from low grade glioma to high grade glioma was 37,5 months. In patients with subtotal resection the average time to malignisation was 26 months while in patients with total resection was 41,3 months. In our series 3 patients have no adjuvant therapy in 5 patients surgery was followed by Rxt and 2 have made both rxt and cht. In those with no adjuvant therapy the free symptom period was 29,3 months and in those in which surgery was followed by adjuvant therapy the free symptom period was 38.5 months.

*Conclusions:* In our series the complete resection and the adjuvant Rxt and Cht in the treatment of low grade gliomas has delayed the time to malignisation. The series is too short to have statistical significance in this controversial subject in the literature. Some interesting cases together with our surveillance protocol in glioma are presented.

**Electrophysiological mapping using background multi-unit activity and local field potentials for targeting subthalamic nucleus**

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*Aim:* To investigate the use of background neuronal activity as a method to improve the accuracy of the target localization for the implantation of deep brain stimulation (DBS) electrodes in the treatment of Parkinson disease.

*Material and Methods:* Between January 2009 and January 2010, fifteen patients with advanced Parkinson disease underwent bilateral implantation of DBS electrodes in the Subthalamic Nucleus (STN) under local anesthesia. Anatomical direct targeting was refined based on electrophysiological functional mapping, using a FHC Guideline 4000 microrecording system. The functional mapping included recording neuronal activity using microelectrodes and performing electrical stimulation. On targeting 12 out of 30 STN, short 2-second segments of data were recorded periodically along the entire electrode trajectory on three simultaneous tracks (typically). Neuronal activity in the frequency band 500 to 6000Hz was recorded, then separated into single and multi-unit activity (MUA) using an unsupervised wavelet thresholding algorithm. On the initial trajectory, we also simultaneously recorded LFP's in the band 0.5 to 100Hz.

*Results:* The MUA power showed a significant enhancement in the target region compared to the baseline with a factor of  $3.07 \pm 1.47$  (Mann-Whitney U-test p The mean improvement of patients according to

the UPDRS scale (III section) was 65% at 6 months follow-up.

*Conclusions:* Background multi-unit neuronal activity recording can be used as a method to refine the anatomical targeting of the STN in patients with Parkinson disease.

### **Partial tibial neurotomy as combined neurosurgical treatment in residual spastic foot in children**

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*Introduction:* Tibial neurotomy is indicated for the treatment of spastic varus plantar flexion (equinus deformity) with or without claw toes. It consists in partial sectioning of one or several motor branches (considered responsive for spasticity and identified by electrical stimulation) after their entire exposing at the popliteal fossa and the nerve epineurium opening (i.e. the nerve fascicles to gastrocnemius and soleus, tibialis posterioris, popliteus, flexor hallucis longus and flexor digitorum longus).

*Aim:* To prove the clinical and functional benefits of tibial neurotomy after other surgical procedures performed, even neurosurgical, but especially orthopedic in our country circumstances where traditionally is first considered.

*Method:* A total of 18 cases with secondary partial tibial neurotomy after other surgical procedures (2 cases of intratecal baclofen pump, 4 cases of dorsal rhizotomy and 12 cases of Achile tendon surgery), all cases in the ambulatory children with equinovarus secondary of the cerebral palsy, between 8 and 16 years old, when the gait is mature.

The clinical examination includes

observation of posture and gait, assessment of passive range of motion, quantification of the degree of spasticity using Ashworth and Tardieu scales.

We used the test by tibial nerve block using local anaesthetics, such as long-lasting bupivacaine which mimicked the outcome of selective neurotomy, in according with the recording of the ankle angle amplitude by goniometry.

Motion analysis using an optoelectronic system is coupled with the evaluation by electrophysiological H reflex recordings. This studies prove the motion pattern modifications during all phases of gait (early-, mid- and late- stance, swing) with resulting instability of the whole body.

*Conclusions:* This surgical procedure cannot be performed in isolation but it must be integrated into a long-term rehabilitation programme that is acceptable for the patient over time. The place of neurosurgery in the treatment of spasticity continues to be studied and refined. When combined with orthopedic and medical approaches, and when the properly selected neurosurgical approach is combined with the properly selected patient, it may offer important advantages to people with spasticity attempting to optimize their function in the community and their activities of daily living.

The cases presented demonstrates the good surgical indication of the combined selective tibial neurotomy in residual foot spasticity after other treatments, even surgical.

**ENT and neurosurgical combined approach of extended skull base tumours intraoperative neuromonitoring role**

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*Aim:* The challenging large skull base tumours extended upwards and downwards can benefit of multidisciplinary team approach including neurosurgeon, ENT surgeon and neurophysiologist. This is justified by large safe resection and less cranial nerve dysfunction.

*Patients and Methods:* A total of three patients will be presented as examples. A 70 years old lady presenting a right sphenoid wing meningioma with an eight years postoperative invasion in orbit and maxillary invasion was successfully solved in a three steps surgery. Another 50 years lady presenting a right sphenoidal osteomeningioma underwent surgery via frontotemporal approach followed by a total tumour resection. A 57 yrs. old patient presenting a large glomus jugulare tumour was operated through a retro and trans mastoidian approach. The most frequently monitored motor nerves were facial and trigeminal nerve. Auditive and visual evoked potentials were used in certain situations.

*Results:* A total tumour removal was performed in all cases. Intraoperative monitoring allows a degree of surgical comfort by providing immediate information regarding the status of the nerves or central pathways. The amplitudes of EMG recordings was maintained in the

physiological range referred to baseline. The latency of evoked potentials was monitored in order not to exceed 1 ms. There were no supplementary postoperative cranial nerves deficits.

*Conclusion:* The multidisciplinary approach associated with neuromonitoring allowed a proper surgical management of extensive head lesions as revealed by our cases and literature.

**Pituitary tumor apoplexy – surgical management and prognosis**

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*Objective:* The most urgent indication for surgery in pituitary adenomas relates to instances of pituitary tumor apoplexy, caused by ischemic necrosis or sudden hemorrhage into a preexisting sellar mass, followed by expansion of sellar contents. The authors review the current standard of management in pituitary apoplexy and present their personal experience.

*Material and Methods:* The authors analyze a group of 28 patients with symptomatic pituitary tumor apoplexy, who presented to Emergency Clinical Hospital "Bagdasar – Arseni" Bucharest between January 2008 and December 2009. Patients were followed for up 2 years (range = 4 months – 2 years). The retrospective study identifies 16 male and 12 female patients with pituitary apoplexy (mean age = 53.3 years, range = 28 – 80). Only 6 (21.4 %) patients had previously known pituitary tumors.



*Results:* Headache (92.9 %) was the most common presenting symptom, followed by nausea (78.6 %) and visual dysfunctions (reduced visual acuity – 57.1 %, visual field defect – 75.0 % and oculomotor palsy – 14.3 %). CT and MRI were used for anatomical evaluation preoperatively and postoperatively. 22 (78.6 %) patients had partial or pan-hypopituitarism at presentation. 18 (64.3 %) patients had non-functioning adenoma, 2 (7.1 %) had prolactinoma, 7 (25.0 %) had somatotroph adenoma and 1 (3.6 %) had corticotroph adenoma. An urgent neurosurgical decompression via a transsphenoidal approach was performed in all cases. Improvement in visual acuity occurred in 92.9 % of patients operated on within the first week, but only in 46.4 % of patients operated on with a greater delay. None of the 22 patients with hypopituitarism had a full endocrine recovery. Steroid replacement during the acute stage was necessary. Long-term hormone replacement was necessary in some cases (steroid hormone – 60.7 %, thyroid hormone – 42.9 %, testosterone – 25.0 %, desmopressin – 7.1 %).

*Conclusions:* The authors advocate urgent transsphenoidal surgical decompression for all patients with pituitary apoplexy, to save life and improve vision and to have a chance at regaining pituitary function. Early surgery, within the first week, leads to a better visual outcome when compared with later surgery. Still, oculomotor palsies improve even if surgery is delayed. Current management of pineal region lesions – an analysis of a personal series of 34 cases.

### **The third's neurosurgical department of Nicolae Oblu Hospital experience in tumors of the third's ventricle**

*I. Poeta, C. Apetrei, B. Iliescu*

Tumors of the third ventricle are rare, representing less than 1% of intracranial lesions. Even though most of them are benign, the management of these lesions is difficult. To make the difference between an incidental inoffensive lesion and a lesion with possible life-threatening complication - sudden death - caused by acute hydrocephalus -, is some time difficult. Symptoms occur usually in adults, with episodes of headache, weakness of the limbs, and loss of consciousness. MRI is the imagistic method of choice. We present our experience in the neurosurgical management of these lesions in the last five years: 2006 – 2010. 24 patients with third ventricle lesions were admitted and 14 of them underwent surgical treatment. We preferred the interhemispheric transcallosal approach for most of the lesions with other approaches chosen for the rest. The remaining cases were considered incidental inoffensive lesions in which we decided imagistic follow up. The histology of the tumors was: colloid cysts (6), astrocytoma (3), craniopharyngioma (2), pinealoblastoma (1), glioblastoma (1), meningioma (1). Patients with third ventricle tumors are at risk for developing impairments in memory, executive function, and fine manual speed and dexterity, which are domains associated with frontal subcortical functions.

**Current management of pineal region lesions – An analysis of a personal series of 34 cases****I. Poata, C. Apetrei, B. Iliescu**

Pineal region tumors comprise of heterogeneous group of neoplasms with different histological origin growing from the pineal gland itself or from structures adjacent to the pineal region. These tumors are rare and account for 0.4 to 1.0% of intracranial tumors in adults. The treatment options for the different pineal region tumors vary according to their histological nature. However, with the exception of germinomas which can be nowadays cured by low-dose radiotherapy and chemotherapy and only require a biopsy for diagnosis, surgery still plays a central role in the management of most of the other pineal region tumors followed or not by adjuvant radiotherapy, chemotherapy or a combination of both. We follow the therapeutic options in our series of 34 pineal lesions series, including the cases with symptomatic pineal cysts. The most common clinical syndromes included: paroxysmal headache with gaze paresis; chronic headache, gaze paresis, papilledema, and hydrocephalus, or pineal apoplexy with acute hydrocephalus. Surgical intervention was performed in 11 cases, the goal being complete tumor removal. Complete tumor removal is desirable; however, subtotal resection is preferable if the tumor cannot be easily separated from the quadrigeminal plate. The remnant tumoral tissue can be considered for adjuvant radio or chemotherapy. Ventricular shunting should be reserved for patients with persistent hydrocephalus after cyst resection.

**Supratentorial ventricular tumors - a surgical perspective****St. I. Forian<sup>2</sup>, C. Abrudan<sup>1,2</sup>, A. Oslobanu<sup>1,2</sup>, Zorinela Andrasoni<sup>2</sup>, M. Danciut<sup>2</sup>**<sup>1</sup>University of Medicine and Pharmacy "Iuliu Hatieganu" Cluj-Napoca<sup>2</sup>Cluj County Emergency Hospital, Department of Neurosurgery

*Aims:* Brain tumors located in the ventricles represent 1,4% from all primary central nervous system tumors. From a surgical point of view, the profound location and the necessity to intersect normal brain tissue with minimal functional alteration, the abundant vascularisation which interfere with normal vasculature, and also large dimensions of tumors, altogether represent problems that must be solved by neurosurgeon. This study consists in a retrospective analysis of 61 cases of intraventricular supratentorial tumors diagnosed and operated in an 12 years period.

*Material and methods:* We retrospectively present the indications, results, outcome and specific characteristics of 61 patients diagnosed with intraventricular supratentorial tumors .

*Results:* Supratentorial intraventricular tumors represent 2,54 % out of 2398 intracranial tumors operated by author between January 1998 and September 2010. Our peak incidence is in the first and sixth decades of life. In a surgical perspective, our strategy is: tumors located in the lateral ventricle are approached by a transcortical route; tumors located in the third ventricle are approached transcallosal or subfrontal trans-laminaterminalis if there is an intraventricular extension from a sellar tumor.

VP-shunt is reserved only for cases of

persistence of symptomatic hydrocephalus after tumor removal, or in cases in which the direct approach was refused or considered too dangerous related to the clinical status of the patient. Temporary external ventricular drainage (first 4 to 5 postoperative days) is largely used after transcallosal or transcortical approach. Considering this we used the transcallosal approach in 57% of the cases, in 28.2% a transcortical approach was performed, in 9.8% of the cases a subfrontal translamina terminalis approach was chosen and in 5% a neuroendoscopic approach was performed. In 86 % of the cases, we managed to obtain total removal. Recurrences occurred in 11% of the cases. Pathological examination revealed a variety of findings: 21.3% astroцитomas, 13.1% malignant gliomas, 11.5% ependimomas, 16.4 % craniopharyngomas, 4,9% choloid cysts, 13.1 % meningiomas and 19.7% neurocytomas, metastases, choroid plex papilomas, gangliogliomas and pituitary adenomas. Postoperative complications consisted in persistent symptomatic hydrocephalus (6 cases), intraventricular bleeding and/or edema in other four cases. The surgical results were very good and good (GOS 5 and 4) in 48 cases, 11 cases with moderate disability (GOS 3) and 2 cases died (one case with multiple metastases and one case with pulmonary embolism).

**Conclusions:** Complete neuroimaging evaluation, a proper surgical approach, progressive debulking of tumor with great attention to preserve normal vasculature, external ventricular drainage in order to prevent acute hydrocephalus are the key points for good surgical results.

**Keywords:** intraventricular supratentorial tumors, transcortical approach, transcallosal approach, hydrocephalus.

### **Temozolomide-loaded gold nanoparticles as an alternative chemotherapy option for inoperable recurrent malignant gliomas**

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High grade malignant gliomas are considered today to be incurable diseases despite neurosurgical intervention followed by adjuvant chemo radiotherapy. This because of a small population of stem-like cells that allow the tumor to acquire resistance to conventional therapy and invade the surrounding nervous tissue. The aim of the current study was to evaluate in vitro the antitumor efficacy of temozolomide-loaded gold nanoparticles (GNPs) in hope to provide a new approach to treat brain cancer with minimal toxicity and an increased efficacy profile.

GNPs stabilized with a monolayer of poly(L-aspartate-cytostatic drug) was synthesized as a tumor targeted drug delivery carrier. The drug (temozolomide, bevacizumab) was covalently conjugated onto the hydrophobic inner shell by acid-cleavable hydrazone linkage. The Au-poly(L-aspartate-drug) GNPs formed stable unimolecular micelles in aqueous solution. Transmission electron microscopy, UV-Vis spectroscopy and nuclear magnetic resonance analysis were employed to characterize the morphological, optical and structural properties of these metallic

nanostructures. The chemical structures formed by GNPs and cytostatics were then added in culture, testing the sensitivity of glioma-derived cancer stem cells.

GNPs facilitated the activity of the alkylating drug to reverse the resistance of cancer stem cells to temozolomide, offering a new chemotherapy strategy for patients diagnosed with unresectable recurrent malignant gliomas.

As intrinsic and acquired resistance to chemotherapeutic drugs is a major obstacle in the clinical treatment of recurrent glioblastoma multiforme and the complete mechanisms for multidrug resistance remain unclear, the development of alternative therapeutic strategies may contribute to a better approach of this lethal disease.

#### **Arsenic trioxide sensitizes brain cancer stem cells to chemoradiation- a differentiation therapy model for glioblastoma**

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Glioblastoma multiforme still has a very dismal prognosis despite complete resection followed by adjuvant chemoradiation. The aim of the current study was to evaluate in vitro the antitumour efficacy of arsenic trioxide in combination with ionizing radiation plus Temozolomide and Bevacizumab against glioblastoma cultured stem like cells, as possible way to increase the therapeutic index.

*Material and methods:* Stem-like tumor

cells isolated from a glioblastoma multiforme biopsy were established by cell proliferation assays and up-regulation of stem cell markers, as proven by reverse transcription – polymerase chain reaction. Low concentrations of arsenic trioxide were added prior to Temozolomide, Bevacizumab and ionizing irradiation.

*Results:* Molecular analysis show that cells express CXCR4, Oct-3/4 and GAPDH when compared to placental mesenchymal stem cells, as well as nestin, GFAP and neurofilament protein. Low concentrations of arsenic trioxide lead to morphologic differentiation, with fewer stem cells in Go state and differentiation-associated cytochemical features, like increased sensitivity to cytostatic drugs and radiotherapy.

*Conclusion:* Arsenic trioxide exposure before conventional postoperative chemoradiotherapy for glioblastoma might increase treatment efficacy. Further in vivo experiments on laboratory animals and analysis of absorption rate and side effects are required.

The Role of Intraoperative Cerebral Echography

#### **Fronto temporal approach in sellar and parasellar meningiomas**

**G. Mild, D. Tusnea, I. St. Florian**

Although the most of the meningiomas are histologically benign tumors, in the case of sellar and parasellar localization, because of the difficulty to approach them, they were considered quasi malignant. There was a period in the neurosurgery, when the surgeons strived for large bone resections, but achieved still incomplete excisions. The aim of this paper is to demonstrate, that even in the absence of high technology, but with vast experience, well aimed

approaches, and with delicate maneuvers in most of the cases it is possible to perform smaller bone resections and total macroscopic excisions.

*Material and Methods:* A retrospective analysis was performed on data obtained in 134 consecutive patients with sellar and parasellar meningiomas who underwent resection between January 1998 and June 2010, from a total of 549 surgical interventions for intracranial meningiomas (498 new cases, the rest of the operations being made for recurrences or for multiple meningiomas)

*Results:* We recorded a female predominance, with an peak incidence in the fifth decade. In the medial group of paracaloid meningiomas (tuberculum sellae, sellar diaphragm, clinoidal and sphenocavernous meningiomas) we recorded 69 cases, mean while in the lateral group (sphenoid wing) we encounter 65 cases. The grade of removal was as it follows: Simson I- 79 cases (59%), Simson II-42 cases (31%), Simson III- 7 cases (5,5%), Simson IV -6 cases (4,5%) . Concerning the pathology the most frequent types were Transitional, Meningothelial and Fibroblastic. In the entire series we noted some local postoperative complications: hematomas , wound infections, cerebral edema, CSF fistula; and also some neurological complications: transient motor deficit, visual worsening, oculomotor palsies, transient diabetes insipidus, cerebral infarction, hydrocephalus. The mortality rate for the entire series was 1% (1 case).

*Conclusion:* Most paracaloidal meningiomas can be removed completely and safely. The most used surgical approach is the standard fronto-temporal approach. In our opinion there is no reason for large bone removal except for cases invading the cavernous sinus and optic canal. When

complete tumor removal is not advisable for whatever reason, the strategy of a subtotal tumor removal followed by radiation therapy can be used.

*Keywords:* parasellar meningioma, surgery, fronto-temporal approach

### **Magnetic resonance tractography for pre-surgical planning in eloquent areas tumors**

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Tumors in eloquent areas of the brain pose a particular challenge to neurosurgery, in terms of tumor removal without inflicting new neurological deficit. Careful pre-surgical planning plays a crucial role in approaching these tumors safely. Knowledge of the relationship between the expanding mass and white matter tracts is one of the important facts to be taken into account in planning this surgery. Diffusion tensor imaging (DTI) can provide a wealth of information on the white-matter tracts using diffusion anisotropy maps. We analyze our series of first 10 patients, 5 males and 5 females, with salient areas infiltrative tumors (postoperatively glioblastoma multiforme in 8 cases), the role of tractography in providing information on the white matter tracts implication in the pathological process and in planning the right approach and extent of tumor removal. All patients underwent appropriate microsurgical tumor resection with preservation of the documented intact tracts, and preoperative neurological function. Our initial experience strongly supports the view that tractography offers essential information in planning a safe surgery for the tumors in eloquent brain areas.

### **Gigantic expandable tumors in advanced stages in the periorbital region**

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*Aims:* Surgical management of orbital tumor requires frequently an approach of the tumor of considerable dimension which concerns as much the periorbital region and the structures from the orbit as well.

According to the data accepted in the literature we defined a gigantic tumor in advanced stage, after the following two principle criteria:

1. Tumor dimensions, maximum diameter of tumor over 8 cm.
2. Extension of the tumor to a structure of vital functional importance: eyeball, optic nerve, middle ear.

*Material and methods:* In our study, we took a sample of 48 cases of orbital and periorbital regional tumors. We did a retrospective study, concerning: sex, age, histopatologic structure, and treatment methods.

*Results:* From a number of 623 cases with surgical orbital and periorbital pathology, the total number of expandable gigantic tumors in the study in advanced stage was of 48 cases; from these 17 cases were malignant, 25 cases were benign tumors, one case was a pseudotumor, 4 cases of inflammation and non specific infection, and one case of parasites.

*Conclusion:*

- Expansive gigantic masses in advanced stages in periorbital region are frequent.

- In most of the cases there was a disruption which is incompatible with ocular function.

- From the surgical procedures that were

carried out, extended orbital exenteration was more frequent.

- To find a solution for these cases a multidisciplinary collaboration is needed.

### **Intraorbital hypertension: Clinical features, diagnosis, treatment-necessary knowledge for any M.D.**

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Intraorbital hypertension (IOH) is a potential sight threatening event. According to the time of the onset it can be acute and chronic. Acute IOH is commonly known as Orbital Compartment Syndrome(OCS). OCS is a rare, uncommon surgical emergency and can be caused by orbital hemorrhage, infections, emphysema, cellulitis, edema. Chronic IOH is most frequently caused by intraorbital expansive processes e.g tumors, pseudotumors, Grave's disease.

*Material and methods:* 79 cases with diseases that involved IOH treated in the Neurosurgery Department of the Cluj County Emergency Hospital were analysed, from which 7 cases of OCS. The main cause for chronic IOH were tumors. The causes of OCS were posttraumatic foreign objects (3 cases), intraorbital hematoma (2 cases), orbital emphysema (1 case), orbital cellulitis (1 case).

*Results:* Patients with chronic IOH presented for proptosis, pain, diplopia, tearing, visual loss. Patients with OCS presented for pain, visual loss, limited eye movement, protrusion. Surgical and medical treatment were indicated in all cases, mentioning that in OCS surgery was an immediately emergency. Medical treatment was made with hyperosmotic

agents (Manitol), carbonic anhydrase inhibitors (Acetazolamide), corticosteroids. In OCS medical treatment is auxiliary to surgical treatment, which is urgent. The aim of surgery for orbital tumors was the total macroscopic removal. In OCS lateral canthotomy and cantholysis are needed. The aim is to prevent optic nerve atrophy, retinal compromise or blindness.

*Discussion:* The treatment for chronic IOH should be made by specialists in ophthalmology, orbital and ophthalmic surgery. The diagnosis is clinical and using imaging methods. Acute IOH is rare, but when it occurs is a surgical emergency. Lateral canthotomy and cantholysis are simple maneuvers, but vision saving procedures, and should be made by the first doctor that treats the patient. Diagnosis is clinical!

*Conclusions:* Chronic IOH when diagnosed, should raise the suspicion of an underlying tumoral process. Surgical treatment for acute IOH must be done in emergency to prevent vision loss.

### **Management of high grade gliomas: Current strategies and dilemmas**

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*Objective:* Malignant glioma is the most common primary intra-axial tumor of the central nervous system. Despite recent therapeutic advances in glioma treatment, the outcome of glioma remains disappointing. The oncologic principle of total tumor resection achieved by complete excision with clear margin is harder to achieve in glioma surgery due to potential

neurological deficits that may be incurred wide margin resection, especially when the tumor is situated near the eloquent cortex. The goals of surgical resection in high grade gliomas are supposed to improve survival outcome, symptomatic control, massive cytoreduction, histological diagnosis and an adequate quality of life for the surviving period.

*Methods:* Authors analyze a large case series of high grade gliomas - 347 cases, operated in the Fourth Neurosurgical Department, between 2001 - 2010 by a team conducted by author, following the same principles of surgery, in which, for every case, the surgical decision was made on the principle of analysis risks versus benefits criteria.

*Results:* From this series, 347 (86,31%) were high grade glioma (glioblastomas primary or secondary, anaplastic astrocytomas, anaplastic oligodendrogliomas, and anaplastic oligoastrocytomas), the rest of 55 (13,68%) being low grade gliomas. The relationship between possible risks and potential benefits of the treatment was based on the evaluation of: tumor localization and size (dominant or nondominant hemisphere, deep or superficial), tumor extension (lobar, multilobar, bilateral), mass effect with midline shift, age, associated diseases, Karnofsky preoperative score (more than 70, less than 70), estimated possibility of total or near-total resection. According to these criteria, massive cytoreduction was achieved and patients were referred for oncologic reduction and adjuvant therapy. The medium survival time for malignant astrocytoma was 24 months, and for glioblastoma was 16 months, surgical standard mortality was 1,99 % (8 cases), morbidity was 7,21% (29 cases).

*Conclusions:* Tumor resection should be considered for histological confirmation, cytoreduction and alleviate mass effect. Aggressiveness of tumor resection is limited by the risk of new neurological deficits with delay further radiotherapy or chemotherapy. Adjuvant intraoperative procedures to facilitate safe tumor resection should be encouraged. Despite malignant gliomas prognosis did not change in the last 20 years, the short term benefits of surgical resection should be all times keep in mind.

### **Neuroprotective effect of hypothermia in severe traumatic brain injury**

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The use of induced hypothermia as a neuroprotection method is rather an old technique it was abandoned for a period of time, then has been retaken for the past 10-15 years.

*Objectives:* Clinical study results regarding induced hypothermia are conflicting. Thus the authors proposed themselves study the efficiency of hypothermia in the management of severe skull and brain injury.

*Material and method:* The study followed the effects of slight hypothermia (T=34,5-35,5 C) in 10 patients with severe brain and skull injuries (GCS=3-7p) comparatively to a witness lot (group) of 12 patients with normal temperature and the same diagnostic.

In the study there were not included the patients with brain death, hypoxia and hypotension >30%, and also the patients in which we could not estimate the timing of

the injury. Were included patients between 17 and 55 years old, 14 being males and 8 females.

*Results:* Mean hospitalisations time in the intensive therapy was similar for the 2 groups.

Comparing the survival rates, these were higher in the hypothermia lot, 60% versus 50%. We must emphasize that the highest survival rate was in the group with a GCS of 5-7 p in both lots.

The incidence of bradycardia and hypotension was bigger in the hypothermia lot, 25% versus 8,33%, needing in some cases inotropic and vasopressor therapy. Coagulation disturbances (↓Plt, ↓PA) were noticed in the vast majority of the patients who belonged to the hypothermic group, without clinical signs of bleeding.

Infection complications were also more frequent in the hypothermic lot, especially lung and urinary infections.

*Conclusions:* Hypothermia is a very good neuroprotection method in brain injuries, with respect to some prerequisites:

- to be started immediately after the primary brain injury;
- the patients must benefit of a very close monitoring to prevent and fight against the early hypothermia side effects;
- cooling and reheating must be done very slowly (5-12 hours);
- if hypothermia cannot be achieved, at least we must obtain normal temperatures.

*Keywords:* hypothermia, brain injuries, monitoring, brain protection.



## **Pediatric guidelines for the management of severe traumatic brain injury**

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Sever traumatic brain injury is associated with a significant morbidity and mortality.

The primary goal in treating any pediatric patient with severe traumatic brain injury (TBI) is the prevention of secondary insults due to hypotension, hypoxia, hypercarbia, anemia, hyperglycemia and cerebral oedema.

The therapeutic management of critically ill children with TBI requires a precise assessment of the brain lesions but also of potentially associated extra-cranial injuries.

Corect management according to new therapeutic guides, consequent to recent studies, is an important goal in order to improve the outcome in this pathology. On the other hand, one of the major goals of resuscitation in these children is aimed at protecting against secondary brain insults (SBI).

In this paper, the authors propose new therapeutic options in the management of TBI. It is a synthetic approach of our vast experience achieved in this domain.

*Keywords:* TBI, child, therapeutic management

## **The main osmolarity disorders in the cerebral pathology**

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The relationship between the cerebral pathology and the fluid equilibrium of the body is a bidirectional one. Various cerebral affections have effects over volemia, but reversely as well, changes of intracellular hydration (edema or dehydration) make a mark on the state of consciousness and on the neurological status.

Perioperative fluid administration, mannitol use, syndrome of inappropriate antidiuretic hormone and cerebral salt-wasting syndrome are potential causes of hyponatremia. Enteral tube feeding, osmotic diuresis and insipid diabetes are potential causes of hypernatremia.

Cerebral pathology which modifies the proper release of antidiuretic hormone (ADH) and the feeling of thirst will have the most diverse and nocuous effects over the body's hydration state, over the structure of the various fluid compartments that will lead, by themselves, to the alteration of the state of consciousness and to the wide extension of the neurological consequences of the initial cerebral pathology, no matter its kind (vascular, malign, traumatic and ischemic).

The therapy for these disorders of osmolarity is specific for the various illnesses producing them, but it is also oriented to general therapy towards maintaining the fluid balance, on one side, and towards the correction of the sodium capital on the other side.

*Keywords:* osmolarity, hypersodemia, hyposodemia, mannitol, insipid diabetes, syndrome of inappropriate secretion of ADH, cerebral salt-wasting syndrome, cerebral oedema, water balance.

**TCI anaesthesia in neurosurgery**

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*Aims:* Target Controlled Infusion (TCI) have been launched as simple, accurate and reliable delivery systems of intravenous drugs. TCI pump function using a programme based on a pharmacokinetic/pharmacodynamic model. The anesthetist sets the desired target blood or effect site concentration and the TCI pump adjusts the rate of delivery of anesthetic agent according to that models. This method was not used until now in Romania for neurosurgery. For patients undergoing neurosurgery it is desirable to have stable and easily controllable hemodynamics. Rapid postoperative recovery is essential to assess neurological function.

*Material and methods:* Our study was designed to analyse two different techniques of anesthesia, TCI with Propofol and Remifentanyl versus Conventional Balanced Anesthesia Sevoflurane - Remifentanyl. We study two lots of patients admitted for cranial or spinal surgery who received this different types of anesthesia. During the surgery we correlated the level of analgesia with the recommended doses and we registered their variations. The awakening quality was evaluated using the Observer Assessment of Alertness / Sedation (OAAS) Score. We measured the hypnotic effect of anesthetics using bispectral index (BIS) for 26 patients. Had been monitored recovery times.

*Results and conclusions:* TCI with Propofol / Remifentanyl is similar to Sevoflurane / Remifentanyl with regard to hemodynamic stability. Time to extubation was significantly shorter in TIVA while cognitive functions and level of consciousness were better in TIVA-TCI group also.

The study was funded by the research grant 41025-CNMP

**Giant, atypical, left, posterior fossa meningioma revealed by rhinorrhea**

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*Objective and importance:* Cerebral supra or infratentorial tumors associated with chronic intracranial hypertension and hydrocephalus may rarely generate spontaneous, non-traumatic rhinorrhea. We report one case of this rare condition with a giant, atypical, left, posterior fossa meningioma.

*Clinical presentation:* A 55-years-old woman was admitted for a 16-year history of headache, 1-year of rhinorrhea, which flow exacerbated when the patient is standing or she bent forward, ataxia, astasia-abasia. Spontaneous rhinorrhea (no history of head trauma or meningitis) stopped suddenly before admission, cephalic increased, his general condition worsened. Native and contrast CT scan disclosed a giant, extraxial, tumor: 7/9/8 cm, developed in the left posterior fossa, but also active, internal, supratentorial hydrocephalus. The anterior recess of the third ventricle was dilated; sella turcica is global ballonised,

with a small disappearance of the floor in its anterior portion.

*Intervention:* The tumor mass was subtotal removed for cardiac rhythm fluctuation and tensional oscillations, confirmed by postop CT scan. After the operation, the patient became free of leakage, a direct approach for rhinorrhea was not needed.

*Conclusion:* A case of non-traumatic, spontaneous, rhinorrhea generated by a giant atypical left posterior fossa, atypical meningioma is described. Using microsurgical resection tumor was subtotally removed, the patient improved and rhinorrhea don't recurred.

*Keywords:* posterior fossa meningioma, spontaneous rhinorrhea

### **Large and giant vestibular schwannomas**

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*Background:* The main objective in treating large and giant vestibular schwannomas (VS) (large - diameter exceeding 3.5 cm and giant - diameter exceeding 4.5 cm) is their complete removal without significant morbidity. Our experience on 7 cases (4 females, 3 males, mean age 42.5 years) with marked brainstem compression, operated between 2004-2009 focuses on factors influencing recurrence and morbidity, especially related to facial nerve function. These patients were included in a series of 32 consecutive vestibular schwannoma excisions.

*Methods:* This report is a retrospective analysis of the surgical outcome of 7 patients with large and giant VS using the

retrosigmoid-transmeatal approach. Several prognostic factors were evaluated: patient age, tumor size and consistency, extent of surgical removal, concurring hydrocephalus, hearing loss, facial nerve function, trigeminal nerve deficits, cranial nerve VI, IX and X palsy, tongue edema, ataxic gait and motor deficits.

*Results:* The mean age was 42.3 years, the mean tumor diameter was 51.8 mm. There were no deaths and the tumors were histologically benign. Extensive microscopic tumor resection was performed in 5 cases related to solid tumor's consistency. Preoperatively hearing loss and high intracranial pressure were encountered in all patients. 4 patients had cerebellar ataxia. Facial anatomical continuity was preserved in 6 cases with solid tumor consistency; 4 patients had a preoperative facial palsy, a good facial nerve function was achieved in 3 cases – House-Brackmann grade I/II. We have met other distinctive signs: cranial nerve V hypoesthesia, VI, IX and X palsy, tongue edema in 2 cases with slight contralateral motor deficit. All patients were clinical and MRI monitored at 3, 6 and 12 months postoperatively.

*Conclusion:* Total resection associated with a low morbidity rate is possible, avoiding recurrence, reintervention and severe scar tissue. In cases with subtotal resection, radiosurgery is recommended to improve outcome.

*Keywords:* large and giant vestibular schwannomas (VS), surgical approach, facial nerve function

### **Gelastc seizures in a patient with right gyrus cinguli astrocytoma**

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*Abstract:* Objective and importance: Gelastic seizure (GS) also known as “gelastic epilepsy” is a rare type of seizure associated with several different conditions such as tumors - hypothalamic hamartomas, tuberous sclerosis, hemangiomas, post infectious foci, cortical temporal dysplasia We report one case of this rare condition generated by a right gyrus cinguli gr.II astrocytoma.

*Clinical presentation:* A 27 years, old male, right handed, was admitted for a 2 years history of very frequent gelastic seizures accompanied sometimes by simple motor partial seizures in both arms, more often being involved his left arm, without impairment of his consciousness state. His neurological examination was normal. Diagnosis was made on native CT scan: minimal hypodense frontal right paramedian lesion, cerebral MRI showed a small right, parenchymal, homogeneous lesion (16/22/15mm), well delimited, involving gyrus cinguli, without perilesional edema and mass effect, hyperintense both on T1 and T2 MR sequences, non-enhancing after Gadolinium. The cerebral lesion was also documented on EEG and video-EEG recordings.

Using an interhemispheric microsurgical approach, above the corpus callosum and the right pericallosal artery, at the level of gyrus cinguli, a yellow-gray, infiltrative

tumour, having a moderate vascularisation had been identified and totally removed. The anatomic-pathological analysis revealed a grade II astrocytoma. The patient recovered very well, without deficits, no gelastic seizures or epileptic manifestations; three months after operation he is still free of seizures.

*Conclusion:* A case of gelastic seizures accompanied by simple motor partial seizures in both arms, without impairment of his consciousness state induced by a grade II right gyrus cinguli astrocytoma is described and documented by radiological and electrophysiological studies. Using microsurgical resection, the tumor was totally removed, the patient clinical condition improved. Without an affective connotation as in temporal or hypothalamus topography, gelastic seizures are not pathognomonic for hypothalamic hamartomas and in the case of frontal localization of the lesion they can be associated with motor involvement of the limbs as in our case.

*Keywords:* gelastic seizures (GS), dacrytic seizures (DS), epilepsy surgery, gyrus cinguli, cerebral astrocytoma

### **Considerations about hemangioblastomas of the central nervous system**

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*Objective:* Hemangioblastoma of the central nervous system are benign tumors that may occur sporadically or in association with von Hippel-Lindau disease. Is the

most common primary intra-axial tumor in the adult posterior fossa. Von Hippel-Lindau disease (VHL) is a multisystem neoplastic disorders characterized by a tendency to develop hemangioblastomas of the retina, brain and spinal cord, renal clear cell carcinoma, pheochromocytomas, endolymphatic sac tumors, and others.

*Methods:* The surgical database of our institution was searched to identify all patients with histologically verified hemangioblastomas occurring from 2005-2010. The medical, radiological, surgical and pathology records from these patients were analyzed.

*Results:* We analyzed 25 patients (12 female and 13 male) which presented with CNS hemangioblastomas. Twenty-two (88%) patients had sporadic hemangioblastomas and three (12%) patients suffered by VHL syndrome. One (4%) patient with hemangioblastoma died as a result of late medical complications. Seven (28%) patients developed obstructive hydrocephalus. The two (8%) patients underwent gamma knife radiosurgery – one patient with a right eye hemangioblastoma and one patient for a left parietal hemangioblastoma.

*Conclusions:* Surgical treatment may be curative in cases of sporadic hemangioblastomas and pre-operative gamma-knife radiosurgery may help reduce the tumor size. Because patients with VHL syndrome are at risk for development of new lesion, they require lifelong follow-up.

*Keywords:* Hemangioblastoma, Von Hippel-Lindau Disease, gamma-knife radiosurgery

### **Microsurgical resection for arteriovenous malformation – series of 121 patients**

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*Objective:* The arteriovenous malformations (AVM) are congenital lesions and represent an abnormal collection of blood vessels wherein arterial blood flows directly into draining veins without the normal interposed capillary beds. The goal of the treatment of brain arteriovenous malformation (AVM) is to perform a complete resection/obliteration to eliminate the risk of secondary hemorrhage, as bleeding means high rates of morbidity and mortality, with shortened survival expectancy. Multimodal therapy is often necessary to obtain complete occlusion of malformation with optimum results.

*Methods:* The authors analyzed 121 patients (66 female and 55 men) with brain AVM admitted in our clinic between 2001 to 2010, whose data were collected retrospectively from the electronic database and image archive.

*Results:* 57 cases (47,1%) have undergone surgery, eight cases (6,6%) were treated by embolization, 22 cases (18,1%) were treated with gamma-knife radiosurgery, 4 patients received combination therapy (surgery + radiosurgery) and 29 patients (23,9%) remained in clinical observation. According to Spetzler-Martin scale series of patients fit the following profile: 19 cases (15,7%) in grade I, 29 cases (23,9%) in grade II, 36 cases (29,7%) in grade III, 23 cases (19%) in grade IV, 11 cases (9%) in grade V and three

cases (2,4%) in grade VI. 16 (13,2%) patients who died (14 (11,5%) unoperated because very serious neurological condition and 2 (1,65%) have been charged in palliative surgery or simple external ventricular drainage of hematoma evacuation).

*Conclusions:* AVM locations in eloquent areas, according to Spetzler-Martin scale as well as a deep AVM location are risk factors in the treatment of asymptomatic AVM. Morbidity is low surgical resection of an AVM when located in non-eloquent area. Bleeding remains the most disabling and the dreaded event in the evolution and natural history of an AVM. Surgical resection is the treatment of choice in selected patients, with increased rates of cure with low morbidity and mortality.

*Keywords:* arteriovenous malformation, Spetzler-Martin grading system, surgical treatment, embolization

### **Management of the third ventricle tumors**

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*Objective:* Tumors of the third ventricle are often benign and grow slowly. There are multiple surgical approaches (transcallosal, subfrontal, interhemispheric, pterional, etc.) but all attempts to use the pathway around the brain that least disturb and minimally displace normal anatomy. Most commonly postoperative complications are hydrocephalus, seizures and cognitive deficits.

*Methods:* 21 cases of third ventricle tumors treated in Fourth Neurosurgical Department in Clinical Emergency

Hospital "Bagdasar-Arseni", Bucharest between 2005 – 2010.

The authors analyzed data that they had collected to study the clinic pathological aspects and review the presentation, imaging, and management of these tumors.

*Results:* Nine of these 21 patients were men and twelve were women. Raised intracranial pressure (ICP) was presented in 12 (57,14%) patients, and the preoperative diagnoses were confirmed on neuroimaging studies. A gamma-knife radiosurgery was performed in 2 (9,52%) patients and a direct surgical approach was performed in 15 (71,42%) patients. One (4,76%) patient received chemotherapy. Six (28,57%) patients received no treatment. The mortality in the our series is 14,2%.

*Conclusions:* Approaches to the third ventricle are difficult and potentially dangerous procedures. The complications are very specific to the type of tumor and its location. The histopathological features are varied, although most of the tumors in the study were infiltrative gliomas.

*Keywords:* third ventricular tumors, glioma, surgical approach, chemotherapy

### **Subacute subdural hematioma C1-C2. The experience of Department of Neurosurgery, Clinical Emergency Hospital Constanta**

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Male, 54 years old, admitted in emergency at Department of Neurosurgery Clinical Emergency Hospital Constanta for pain in the neck slight tetraparesis, more on the right side, pain in the left shoulder.

CT Scan of the head and the cervical spine: indefinite for the diagnosis.

MRI of cervical spine: Subdural lesion C1-C2 predominantly on the right side (possible haematoma)

*Surgical treatment:* laminectomy C1-C2, predominant on the right side, microsurgical aspiration of the haematoma.

Postoperative status: disappearance of tetraparesis. It rested a slight pyramidal syndrome more specifically crural on the right side.

Postoperative neurosurgical supervision: 4 months

*Conclusion:* Subdural C1-C2 haematoma is a very rare lesion

Surgical treatment is mandatory for healing and a good neurological evolution

MRI was the only investigation who diagnose the lesion and give the neurosurgical team the dates optimal for a good surgical strategy.

### **Metastatic spine disease – management options**

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*Background:* Spine metastases represent a growing problem in cancer patients and have a potential to cause significant functional impairment or even death. Left untreated, the clinical course of spine metastases is toward progressive loss of motor, sensory and autonomic function.

*Objectives:* To assess the demography, neurological status, histopathology and short-term outcomes of surgery in spine metastatic patients.

*Methods:* Data from forty-four patients with spine metastases admitted and

operated in Neurosurgery Unit IV – Bagdasar-Arseni Hospital, from 2005-2010, were retrospectively reviewed. Demographical and clinical data were reported, along with the short-term outcomes following the surgery. The extent of the spinal metastases was preoperatively assessed on appropriate imaging studies and technically suitable and feasible surgery was performed, such as vertebrectomies, piecemeal thorough excision, curettage, or palliative surgery.

*Results:* The majority of spinal tumors (72%) operated in our unit were metastases. The incidence among males has been double compared to females. The mean age was 56.7 years. Lung and breast were the primary cancers involved the most (18% and 16 % respectively). However, at the time of admission, only 34 % of patients had diagnosed a malignancy, and for another 16 % of them, the primary cancer was diagnosed over the admission interval. In 39 % of cases, the primary source of metastasis has not been detected even following the conventional histopathological analysis. Solitary metastases have been found in almost half of patients. Thoracic region was involved the most, followed by lumbar spine. Local pain was present in all cases. In addition, 45% of patients presented symptoms of spinal cord/ cauda equina compression. The rest of them exhibited signs of nerve roots compression only. Sphincter troubles were noted in 36% of cases. 70% of patients were able to walk at the time of surgery. Synchronous metastases were observed in 25 % of cases, most of them involving other bones. All patients had a good short-term postoperative outcome, with better pain control, ambulation and neurological improvement. Only one complication was reported, an epidural hematoma, that has been evacuated in emergency and the

patient recovered with no additional deficits.

*Conclusions:* Surgery is playing a key role in the management of spinal metastases patients, with good short-term results and low complications rate. Nevertheless, selecting the suitable patients for surgery and choosing the proper operation for metastatic spinal tumors is often difficult, and depends on many factors, especially the life expectancy and the balance of the risk of surgery against the likelihood of improving quality of life.

### **Thoracic spinal stenosis**

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*Introduction:* The presence of the stenosis in the thoracic region with its related clinical manifestations has only been recently appreciated. Thoracic spinal stenosis due to ossified ligamentum flavum is less common than cervical or lumbar spinal stenosis and it has been documented to occur predominately in Japanese population. In non-East Asian populations

there are only few cases in the literature.

*Material and method:* In this article the authors describe a case of a patient with 59 years of age admitted in our department with slowly progressive thoracic myelopathy. IRM and CT of the spine revealed posterior thoracic stenosis, due to ossified ligamentum flavum. The patient was undergone to surgery, consisting of laminectomy and resection of ossified ligamentum flavum. Histologically ossification of the ligamentum flavum was identified by completely ossified bone. Postoperative the patient has a favorable course and was discharged after seven days with GOS 5.

*Conclusions:* Thoracic ossified ligamentum flavum develops in the lower thoracic spine in middle-aged men, very rare in non East Asian populations. Generally the diagnosis and treatment is delayed due to long-delayed onset of symptoms and many cases are complicated by the presence of multiple spinal lesions. Until now, no clear therapeutic guideline and no evidence based data are available.