

# ABSTRACTS

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## **LOW RATE OF DELAYED DETERIORATION REQUIRING SURGICAL TREATMENT IN PATIENTS TRANSFERRED TO A TERTIARY CARE CENTER FOR MILD TRAUMATIC BRAIN INJURY.**

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### **Object**

Patients with mild traumatic brain injury (mTBI) only rarely need neurosurgical intervention; however, there is a subset of patients whose condition will deteriorate. Given the high resource utilization required for interhospital transfer and the relative infrequency of the need for intervention, this study was undertaken to determine how often patients who were transferred required intervention and if there were factors that could predict that need.

### **Methods**

The authors performed a retrospective review of cases involving patients who were transferred to the University of New Mexico Level 1 trauma center for evaluation of mTBI between January 2005 and December 2009. Information including demographic data, lesion type, need for neurosurgical intervention, and short-term outcome was recorded.

### **Results**

During the 4-year study period, 292 patients (age range newborn to 92 years) were transferred for evaluation of mTBI. Of these 292 patients, 182 (62.3%) had an acute traumatic finding of some kind; 110 (60.4%) of these had a follow-up CT to evaluate progression, whereas 60 (33.0%) did not require a follow-up CT. In 15 cases (5.1% overall), the patients were taken immediately to the operating room (either before or after the first CT). Only 4 patients (1.5% overall) had either clinical or radiographic deterioration requiring delayed surgical intervention after the second CT scan. Epidural hematoma (EDH) and subdural hematoma (SDH) were both found to be significantly associated with the need for surgery (OR 29.5 for EDH, 95% CI 6.6–131.8; OR 9.7 for SDH, 95% CI 2.4–39.1). There were no in-hospital deaths in the series, and 97% of patients were discharged with a Glasgow Coma Scale score of 15.

### **Conclusions**

Most patients who are transferred with mTBI who need neurosurgical intervention have a surgical lesion initially. Only a very small percentage will have a delayed deterioration requiring surgery, with EDH and SDH being more concerning lesions.

In most cases of mTBI, triage can be performed by a neurosurgeon and the patient can be observed without interhospital transfer.

### **EANS Young Neurosurgeons Meeting 2011**

*Funding:* The authors have no funding to disclose.

*Financial Disclosure:* The authors did not generate any financial support with this submission.

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*Key words:* complicated mild traumatic brain injury, repeat head CT, systematic review

## **MICROSURGICAL RESECTION OF SYMPTOMATIC BRAINSTEM CAVERNOMAS: SURGICAL APPROACH AND CLINICAL EXPERIENCE WITH 38 PATIENTS**

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### **Objective**

The goal of this study was to analyze the outcome of symptomatic brainstem cavernous malformations(BCMs) after microsurgical resection, to summarize the microsurgical experience, surgical indications and surgical timing, and to discuss the optimal surgical strategy of BCMS.

### **Methods**

A retrospective analysis was performed in 38 consecutive BCMS who underwent microsurgical resection in the sub-acute phase between Jan. 2000 and Dec. 2009. The precise brainstem location, size of the lesions, relationships to the pial-ependymal surface, surgical approach, and preoperative magnetic resonance imaging(MRI) were evaluated as prognostic factors possibly influencing outcome. Microsurgery was performed with using of neuronavigation(n=5), and neurophysiological monitoring(n=27).

### **Results**

All 38 patients received microsurgical resections without surgery-related mortality, and 37 patients were completely extirpated. 9 lesions were in the midbrain, 23 lesions in the pons, 6 lesions at the medulla oblongata. Postoperatively, 21 patients who experienced neurological deficits had functional improvement after surgery, 15 patients had no change in the neurological status over time to their preoperative condition or better, and 2 patients deteriorated. During the follow-up, 28 patients had resumed activities of daily living(KPS=90-100), 8 patients were able to self-care with some efforts (KPS=70-80), 1 patients needed considerable assistance(KPS=50-60) and 1 patients suffered hemiparesis(KPS scores of 40). None of the patient had recurrent hemorrhage. Postoperative complications included new cranial nerve deficits in 13 patients, motor deficits in 3 patients, and new sensory disturbances in 6 patients.

### **Conclusion**

Timely and complete surgical resection is recommended for symptomatic BCMS after the first bleeding. Careful preoperative planning, selection of the optimal operative

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approach and a meticulous microsurgical technique are mandatory. Refined microsurgical techniques are paramount to achieve safe surgical removal of BCMs with good outcomes. Neuronavigation is indicated to choose the best angle of attack and the most direct trajectory for selecting approaches. Under intraoperative monitoring, we could safely determine the optimal location for the first incision in the surfaces of brainstem and delineate the relatively safe alleys where the brainstem can be approached without injuring important neural structures.

**Key Words**

Brainstem cavernomas, Surgical timing, approach, microsurgery, neuromonitoring.

## **UTILITY OF ROUTINE FOLLOW-UP HEAD CT AFTER MILD TRAUMATIC BRAIN INJURY: A SYSTEMATIC REVIEW OF THE LITERATURE**

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### **Objective**

To evaluate the efficacy of routine follow-up computed tomography (CT) scans of the head after complicated mild traumatic brain injury (TBI).

### **Methods**

We reviewed 74 English-language studies published from 1999 to September 2009, found by searching the PubMed database using a combination of key words. Excluding studies with missing or inappropriate data, 1378 patients in 17 studies met our inclusion criteria: complicated mild TBI, defined as GCS score 13-15 with abnormal initial CT findings, and follow-up CT. For them, we determined the progression and type of intracranial hemorrhage, time from trauma to first scan, time between first and second scans, whether second scans were obtained routinely or for neurological decline, and the number of patients who had a neurosurgical intervention.

### **Results**

Routine follow-up CT showed hemorrhagic progression in 19.4% (n=268) of patients. Change in routine follow-up head CT did not predict need for neurosurgical intervention (p=0.10), however, symptomatic head CT did (p=0.00045). For the 43 patients (3.1%) who declined neurologically, findings on the second CT scan were worse in 30 subjects (70% of 43) and unchanged in the rest. Overall, 2% (n=27) of all patients underwent neurosurgical intervention. They were comprised of four patients (0.3%) who had follow-up CT routinely and 23 (1.7%) patients whose follow-up scans were based on neurological decline.

### **Conclusion**

Routine follow-up CT scans rarely alter treatment for patients with complicated mild TBI. Follow-up CT scans based on neurological exam alter treatment 5 times more often than routine follow-up CT scan.

### **EANS Young Neurosurgeons Meeting 2011**

*Funding:* The authors have no funding to disclose.

*Financial Disclosure:* The authors did not generate any financial support with this

submission.

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***Key words:* complicated mild traumatic brain injury, repeat head CT, systematic review**

**DISTAL TRANS-SYLVIAN KEY-HOLE APPROACH FOR SUPRATENTORIAL ANEURYSMS: SIMC EXPERIENCE.**

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**Background**

The cosmetic and functional complications of conventional pterional craniotomy for aneurysm clipping include temporal muscle atrophy, scalp deformity, facial nerve palsy, and bald spot on the incision.

**Methods**

To contribute early social recovery of the patients, we propose distal transsylvian key-hole approach for unruptured supratentorial aneurysms. After preemptive analgesia, 5cm linear scalp incision was made along the hairline beginning at the zygoma. Via subfascial route, minimal retrograde temporal muscle dissection was made preserving STA and facial nerve. A burr hole was drilled on at MacCarty's point, and 3cm bone-flap was removed and sphenoid ridge was drilled off. This size of craniotomy provides enough room for sharp dissection of sylvian fissure from a distal sylvian point, and surgical manipulation for aneurysm clipping. The surgical procedure was carried out with conventional microsurgical, bayonet-shaped short instruments and with assistance of MEP and SEP monitoring. Results of the SF 36 health survey questionnaire a year after surgery disclosed this technique provides significantly better patient outcome compared to conventional craniotomy.

**Conclusions**

This technique can prevent temporal muscle atrophy and scalp deformity preserving STA and facial nerve, and contribute early social recovery of the patients after aneurysm surgery. The point of this procedure will be discussed with intraoperative videography.

## **SURGICAL TREATMENT OF SPINAL DURAL ARTERIOVENOUS FISTULAS**

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*Key words:* spinal AVM, dural fistula, surgical treatment.

Material study consisted of of 92 patients with dural AV fistulas operated on from 1998 to 2010. All the 92 patients were given open microsurgical switch-off the AV fistula. Prior to this, in 27 patients was conducted endovasal obliteration of the fistula as an independent method of treatment. However, due to recurrent fistula and progression of neurologic symptoms were admitted to an open microsurgical intervention.

To study the effectiveness of the treatment was performed a standardized assessment of neurological status before the intervention, at discharge patients from the hospital, and in the late period after 4 - 48 months. Of the 92 operated patients with dural AVF after the surgery a "significant improvement" was noted in 21 patients, "improvement" - in 62 patients, "no change" - - 9 patients, deterioration of neurological status was observed. Results of treatment of spinal dural AVF depends entirely on the completeness and adequacy of switch-off pathological anastomosis between feeding artery and drain vein that safely and radically may only be done using microsurgical treatment.

## **BRAIN NETWORKS SUBSERVING LANGUAGE FUNCTIONS.**

### **LESSONS FROM FIBER DISSECTION, DIFFUSION TENSOR IMAGING-MR AND SUBCORTICAL BRAIN MAPPING DURING AWAKE SURGERY**

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## **Introduction**

The authors sought to investigate the three-dimensional structure of the white matter pathways of the human brain by means of the fiber-dissection technique and diffusion-tensor magnetic resonance imaging (DT-MRI) to assess the utility of the combination of both techniques as learning and surgery planning tools for supratentorial lesions. Moreover, the authors analyse the anatomo- functional characteristics of white matter fibers, comparing the results obtained with intraoperative functional subcortical mapping during awake surgery for intrinsic supratentorial brain tumors with postoperative tractography.

## **Materials and methods**

60 formalin-fixed human hemispheres were dissected using Klingler's fiber-dissection technique, in order to detect the three-dimensional architectural anatomy of association and projection fibers. 250 patients with supratentorial cerebral gliomas and 6 healthy volunteers were studied pre and postoperatively using DT-MRI (1,5 T) and tractographic reconstruction. The ROI (region of interest) to tract the fibers were chosen with the aid of the results obtained with white matter fiber dissection technique. Results of intraoperative direct subcortical stimulation of white matter fibers during 250 awake surgeries for resection of supratentorial gliomas in high eloquent regions were compared to postoperative tractography, in order to reveal the anatomo-functional correlation of white matter fibers.

## **Results**

In all specimens the subcomponents of the superior longitudinal fasciculus, the inferior fronto-occipital and uncinate fasciculi, the inferior longitudinal fasciculus, the optic radiations, the subcallosal fasciculus and internal capsule were identified. A precise tractography was possible due to the correct position of the ROI. All responses obtained during subcortical mapping of language function were

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correlated postoperatively with tractographic anatomy. A model of language networks subserving language function has been drawn.

**Conclusion**

A detailed knowledge of the three-dimensional anatomy of white matter fibers and their anatomic-functional correlations is mandatory for neurosurgeons dealing with supratentorial brain lesions. The fiber-dissection, DT-MRI techniques and intraoperative subcortical mapping during awake surgery are reciprocally enriched both in their application to the study of the complex intrinsic anatomic-functional architecture of brain networks subserving language function.

## **PITUITARY MACROADENOMA SURGERY WITH 3,0T INTRAOPERATIVE MR IMAGING- PROSPECTIVE STUDY**

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### **Introduction**

Intraoperative MR imaging (iMRI) seems to be especially useful in sellar region surgery. The effect of iMRI on the extent of sellar region tumours resection needs to be analyzed in larger series.

### **Methods**

In two years period from April 18th, 2008 all pituitary adenomas treated via endonasal route were indicated for surgery with iMRI. This cohort consists of 182 cases. Altogether, in 16 cases no iMRI was performed (surgery for postoperative cerebrospinal leakage - 8 cases, pacemaker - 3 cases, postoperative hemorrhage - 2 cases, no insurance coverage - 1x, magnetic material in the skull - 1x, surgery abandoned due to medical reasons - 1x. iMRI was performed in 20 microadenoma cases. This cohort is not analyzed in this study. Thus, iMRI was performed in 146 pituitary macroadenoma cases. The goal of surgery (either radical or partial resection) is always set before surgery.

### **Results**

Intention to radical surgery group consists of 72 cases. Goal of surgery was achieved before iMRI in 74,6% of cases. iMRI was wrongly evaluated as radical resection but postoperative MRI showed small pituitary adenoma residuum in 2,8% of cases. iMRI disclosed residuum in 22,5% of cases. Further resection led to radical resection in 87,5% of these cases. Radical resection was achieved without iMRI in 74,6% of cases, with iMRI in 94,3% of cases. Intention to partial resection group consists of 74 cases. No further resection after iMRI was performed in 54,3% of cases, further resection after iMRI was performed in 45,9% of cases. Complications: unilateral vision deterioration - 0,8%, redo surgery for postoperative cerebrospinal leakage - 4,8%, postoperative diabetes insipidus - 7,2%. No technical problem with iMRI was observed.

### **Conclusions**

iMRI helps to increase the extent of sellar region resection. No increase of morbidity was observed in our study. No infectious complications were observed. Further larger studies are needed to evaluate impact of iMRI in sellar lesions.

## **IMPACT FACTOR ANALYSIS OF POST-OPERATION LIFE QUALITY ACCORDING TO KPS IN ADULT SUPRATENTORIAL SUPERFICIAL LOW-GRADE GLIOMA**

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### **Objective**

We assessed the life quality of adult supratentorial superficial low-grade glioma (ASS-LGG) patients according to Karnofsky Performance Scale (KPS) and analyzed the relevant factors. Some benefit factors were found through this research to guide the therapeutic strategy and improve the patients' prognosis after glioma surgery.

### **Method**

One hundred and four adults with ASS-LGG were collected and analyzed retrospectively from 2008 to 2009. The follow-up time was from three months to half of a year. The logistic regression was used to discuss the relationship between the life quality after surgery according to KPS and the impact factors such as age, gender, operation time, size and location of the tumor, degree of resection, and tumor grade before surgery.

### **Result**

We found that four out of ten candidate factors have pertinence with the improvement of the life quality after surgery. They are age more than 40 years, the size of tumor less than 5cm, tumor located in the right hemisphere and limited resection of tumor in functional area.

### **Conclusions**

It's seems more significant to judge ASS-LGG patients' prognosis on the base of life quality because of the patients' long-time survival. To ASS-LGG patients, we could predict the life quality according to KPS after surgery depending on the patients' age, and size and location of the tumor. It is benefit to the improvement of life quality if the tumor is resected at early stage. Relieving the size of the tumor and acquiring the pathological diagnosis should be recommended instead of the en bloc resection in functional area.

### **Keywords**

Life quality; low-grade glioma; adult supratentorial superficial; surgical therapy; Karnofsky Performance Scale (KPS); impact factor

## **THE FLUORESCEIN SODIUM TUMOR STAINING AND INTRAOPERATIVE DIRECT THIRD VENTRICULOSTOMY IN THE MANAGEMENT OF POSTERIOR THIRD VENTRICULAR TUMOR WITH HYDROCEPHALUS**

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### **Objective**

Surgical resection of deep-seated midline brain tumors does not always resolve obstruction of cerebrospinal fluid pathways, and an additional operation - ventricular shunting - is required. To prevent postoperative obstructive hydrocephalus, we combine tumor removal and internal ventricular shunting in 1 stage.

### **Methods**

Between 2000 and 2008, 82 patients with deep-seated midline brain tumors (tumors of the third ventricle, pineal region, thalamus, upper brainstem, and superior half of the fourth ventricle) underwent 84 tumor resections with intraoperative internal ventricular shunting. Two types of intraoperative shunting were performed: direct third ventriculostomy with fenestration of the premammillary membrane of the third ventricle floor and Liliequist's membrane, 53 operations; and aqueductal stenting, 30 operations. In 1 patient, third ventriculostomy and aqueductal stenting were performed simultaneously.

### **Results**

As most of the tumors had an infiltrative growth pattern, gross total tumor removal was achieved in only 31% of patients in this series. There were no fatal outcomes related to the surgery. Follow-up data were collected in 73 patients (89%) and ranged from 2 to 68 months (median, 16 months). Additional shunting because of inadequate function of stoma or stent was performed in 13 patients at various times after surgery (median, 30 days). The Kaplan-Meier survival analysis demonstrated that at 12 and 24 months the intraoperative direct third ventriculostomy success rates were 67 and 61%, respectively; aqueductal stenting success rates were 93% at both 12 and 24 months.

### **Conclusion**

Intraoperative direct third ventriculostomy and aqueductal stenting under direct visual control were found to be reliable methods of hydrocephalus management in patients with deep-seated midline brain tumors.

## **INTRAMEDULLARY SPINAL CORD TUMOURS SUREGRY – CHANGES IN TREATMENT STRATEGY**

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Intramedullary spinal cord tumour (IMSCT) surgery still belongs to the group of surgeries with high risk of permanent deficit. Goal of intraoperative motor function monitoring was to decrease rate of bad outcome.

### **Goal of the study**

Comparison of surgical treatment results before and after establishing routine intraoperative monitoring (IOM) using transcranial motor evoked potentials (TcMEPs).

### **Material and methods**

Group A - without IOM: 29 patients (18 males, 11 females), 21-80 years of age (mean 49.6) underwent surgery between 1/98-12/04 were reviewed retrospectively. Preoperative modified McCormick scale (mMCS) 1-2: 12 (41.4%), 3-4: 17 (58.6%); 3 months after surgery - mMCS 1-2: 12 (41.4%), 3-4: 17 (58.6%). Histological findings: ependymoma 16x (55.2%), astrocytoma 2x (6.9%), others 11x (37.9%).

Group B - with IOM: 61 patients (37 males, 24 females), 16-77 years of age (mean 42.8) operated for intramedullary spinal cord tumour with routinely performed IOM using transcranial MEPs were consecutively included. Preoperative mMCS 1-2: 36 (59.0%), 3-4: 25 (41.0%); 3 months after surgery - mMCS 1-2: 35 (57.4%), 3-4: 25 (41.0%), 1 patient died (1.6%) 3 days after surgery – multiorgan failure. Another 1 patient died in 16 months – disease progression - glioblastoma. Histological findings: ependymoma 22 (36.1%), astrocytoma 9 (14.7%), cavernoma 9 (14.7%), hemangioblastoma 7 (11.5%), others 14 (23.0%).

### **Results**

Radical and subtotal resection were achieved in 9 patients (31.3%) in group A and 42 (68.9%) in group B ( $p=0.0007$ ). Preoperative clinical finding according to mMCS was slightly better, postoperative worsening 3 months after surgery was nonsignificantly higher in group B. Time to surgery < 2 years was in 20 (69.0%) in group A and in 41 (67.2%) in group B - nonsignificant.

### **Conclusion**

Lot of factors positively influenced IMSCT surgery outcome. One of significant influences seems IOM. Increased radical and subtotal resection rate may be taken into account of IOM influence. Even if the radicality was significantly higher in IOM group, rate of permanent morbidity decreased. Neurological outcome differed very little comparing to initial status in group B. Despite better diagnostic equipment, pateint history duration did not changed at all.

## 5-ALA-INDUCED FLUORESCENCE GUIDANCE IN SURGERY OF INTRAMEDULLARY TUMORS

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### Background

Fluorescence guidance with 5-ALA is an established method for resection of malignant brain gliomas. However, little is known about utility of this method in surgery of intramedullary tumors.

### Methods

13 patients with cervical and thoracic intramedullary tumors were studied. Prior to surgery patients were administered with 5-ALA 20 mg/kg per os. 5-ALA-induced PPIX fluorescence was visually detected using blue light and fluorescence filter and quantitatively measured by laser spectroscopy. Ratio of tumor/normal spinal cord fluorescence was calculated. Tumor morphology was confirmed immunohistochemically.

### Results

Morphological pattern included 9 ependymomas, 3 pilocytic astrocytomas, 1 glioblastoma. Bright visible fluorescence was observed in 8 of 9 ependymomas with tumor/normal cord ratio of 10 to 34. Although no visible fluorescence was found in 1 ependymoma, laser spectroscopy showed fluorescence ratio of 11 and histology revealed hemorrhagic infiltration of the tumor that could diminish visible fluorescence. Small tumor remnants were revealed with fluorescence in 2 cases after ependymoma removal. In pilocytic astrocytomas, 1 of 3 showed moderate visible fluorescence with ratio up to 10. Highest fluorescence intensity was found in glioblastoma with ratio up to 42.

### Conclusions

Intramedullary ependymoma accumulates PPIX following 5-ALA administration as well as glioblastoma and some pilocytic astrocytomas. Intensity of fluorescence enables visual intraoperative detection of tumor tissue. 5-ALA-induced fluorescence guidance may be a useful modality in surgery of intramedullary tumors.

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## **PORTAL ENDOSCOPIC SURGICAL METHODS OF TREATMENT OF LUMBAR DISC HERNIATIONS.**

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### **Introduction**

As we all know lumbar disc herniation is the most often pathology in spinal surgery. There is a big variety of surgical methods to perform from standard discectomy, microdiscectomy to percutaneous discectomy, endoscopic discectomy etc. However, due to the recent advancement of optical technology and the development of related devices, a remarkable progress has been made in lumbar discectomy by using minimally invasive surgery. By minimizing not only skin incision but also approach related morbidity, an adverse effect to the nerve root can be reduced to the minimum. This outstanding progress made it possible to do the one-day-surgery or so-called outpatient-surgery releasing patient to normal life within 24 hours after the surgery.

Lumbar disc herniations are the most often.

### **Material and methods**

From January 2008 till April 2010 we operated 115 patients using new progressive endoscopic portal access and compared them to recently used endoscopic discectomy by Destandau. All patients had a one level lumbar disc extrusion. The patients with bilateral radiculopathy and segment instability were excluded. All patients had preoperative MRI. Radicular pain was measured using pain audit tables pre- and postoperatively. Quality of life was measured by Euro-qual 5D questionnaire. Postoperatively, all patients were mobilized as soon as the pain subsided and discharged within 24-48 hours after surgery. Patients were followed up 1, 3 and 6 months evaluating by the same scales.

### **Results**

We compared technical difference and "use-ability" of new techniques and previous generation of endoscopic microdiscectomy and found that new techniques are more flexible and give the opportunity to work in the same manner as in standard microscopic discectomy sufficiently minimizing operation trauma. Our minimum desired follow-up was 6 months. The average surgical time was 80 min (range 40-120 min). Average blood loss was 20-30 ml. 6 month MRI showed adequate decompression 113 cases. Overall 93% of patients had good-to-excellent results, with 2 patients having recurrence and were reoperated using microdiscectomy technique.

### **Conclusion**

New portal endoscopic discectomy techniques make it possible to minimize operation trauma and can be used in all cases of lumbar disc herniations. This new methods are a successful merge of microdiscectomy and endoscopic technology and are efficient, safe and reliable.

## **THECALOSCOPY IN TREATMENT OF ADHESIVE SPINAL ARACHNOIDITIS AND SPINAL ARACHNOID CYSTS**

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### **Objectives**

Spinal arachnoiditis and spinal arachnoid cysts are common conditions with primary (congenital) and secondary (posttraumatic and iatrogenic) mechanisms, which are associated with serious neurological deficiency. Nevertheless, until recent time there were no radical methods of surgical treatment because of large area of alteration and, therefore, necessity of invasive approach with significant length of dura opening. Objective of our study was to assess possibilities of thecaloscopy in treatment of posttraumatic spinal arachnoiditis.

### **Methods**

All studied 17 patients undergone neurological examination and MRI of altered spine level. After verification of adhesive arachnoiditis (10 patients) or arachnoid cysts (7 patients), we performed surgical operation including less invasive surgical approach (1-1.5-level laminectomy), dura opening and insertion of 1.2-mm flexible thecaloscope (Karl Storz). After exploration of subdural space and pathologic lesion we performed endoscopic perforation of cyst or dissection of adhesions using special instrumentation. Results were assessed by neurological follow-up and post-op MRI.

### **Results**

Intra-operatively full visualization of altered zone was possible in all cases. Area of exploration is not limited and spreads from upper-cervical level to cauda equina (independently on surgical approach level). Perforation of adhesions or cyst walls let us restore physiological CSF circulation and explore all subdural spaces closed to altered level(s). There were no intra-operative (e.g., bleeding, dura perforation etc) or post-operative complications. Patients were discharged on days 5 and 6. Neurological improvement was seen in all cases; no cases of neurological deterioration were seen. During follow-up period, neurological status was stable; no MRI relapses were seen.

### **Conclusions**

Although limited size of studied group, it was stated that usage of thecaloscopy is efficient and safe method. Taking into account, that adhesive spinal arachnoiditis is systemic process and spinal arachnoid cysts can be extended as well, thecaloscopy is the most radical and less-invasive way of surgical treatment existing currently in neurosurgery.

**ENDOSCOPIC-GUIDED PERCUTANEOUS RADIOFREQUENCY CORDOTOMY: DEVELOPMENT OF A NEW TECHNIQUE.**

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The authors present the first series of the clinical implementation of endoscopic-guided percutaneous anterolateral radiofrequency cordotomy in patients with cancer-related pain. The aim of this work is to demonstrate the first development of intradural endoscopic visualization of the cervical spinal cord via a percutaneous approach to refine the spinal target for anterolateral cordotomy, avoiding undesired trauma to the spinal tissue or injury to blood vessels. The endoscopic visualization provided clear identification of the pial surface of the spinal cord, arachnoid membrane, dentate ligament, dorsal and ventral root entry zone, and blood vessels. The target for electrode insertion into the spinal cord was determined to be the midpoint from the dentate ligament and the ventral root entry zone. The endoscopic guidance shortened the fluoroscopy usage time and no intrathecal contrast administration was needed. Cordotomy was performed based on the standard radiofrequency method after refining of the neurophysiological target. The authors presents 15 cases (10 males, 5 females) of patients with oncologic pain (26,6% lung carcinoma, 20% prostate carcinoma, 13,3% cervix carcinoma, 6,6% breast carcinoma, 6,6% bladder carcinoma and 26,6% others) submitted a endoscopic cordotomy. Satisfactory analgesia was provided in all patients by the procedure with no additional complications or CSF leak. The initial use of this technique suggests that a percutaneous endoscopic procedure may be useful for particular manipulation of the spinal cord, possibly adding a degree of safety to the procedure and improving its effectiveness.

**Key words**

pain, cancer, percutaneous cordotomy, spinal endoscopy, radiofrequency, spinal cord

## **ENDOSCOPIC ENDONASAL PITUITARY SURGERY: PRACTICAL KEY POINTS WHICH WE HAVE LEARNT THROUGH OUR LEARNING CURVE (4 YEARS EXPERIENCE)**

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### **Background**

Conventional transsphenoidal pituitary surgery is increasingly replaced by endoscopic endonasal approach. After 3 years of conventional TSS, We began to practice endoscopic pituitary surgery. In the first year we tried mixed approach and then used pure endoscopic endonasal approach for the last three years. Have a look on how we have been passing the procedure's learning curve, it revealed to us so many important hints we found them worth mentioning.

### **Methods**

We reviewed the data sheets and movies of our first 30 (total 110 patients) endoscopic endonasal transsphenoidal pituitary surgeries. Details of various parts of approach with pre and post operative images and follow up data reviewed and modifications in each part according to later cases were noticed.

### **Results**

With more practice, the size of dural opening, the ability to addressing suprasellar or lateral extensions and at last the ability to do an extracapsular dissection increased while risk of post-operative DI and intraoperative CSF leak decreased. However the rate of complications does not change. Practical key points to achieve these results along with technical improvements were discussed. Key principles and critical equipment used in the procedure with anatomical and surgical hints have been emphasized.

### **Conclusions**

Beside scientific knowledge that should be obtained in field of anatomy, another need is the ability to work and use endoscope in a teamwork manner which is the most basic difference from microsurgery. So, there is a learning curve and beginner's pitfalls could be of tremendous help for the others to cope with the new setting.

## **TECHNIQUES IN PREVENTING SHUNT INFECTION IN EMERGING ECONOMY**

Dr.Sumana P and Dr.M.Balamurugan

### **Abstract**

Shunt Infections are the most common complication associated ventriculo-peritoneal shunts. The average reported shunt infection rates is around 10% ventriculo-peritoneal shunt surgery. Most of the shunt infections are believed to occur during the surgery.

### **Objective**

The objective of the paper is to compare the shunt infection rates and the parameters associated with it, in our shunt series.

### **Material and methods**

In our hospital we have performed 300 shunt surgeries for hydrocephalus over last five years from January 2005 till December 2009.

### **Results**

In our series of patients, there were <1% shunt infections during our follow up period of minimum 1 year. The average duration of the surgery from the incision time to closure of wound was 18mins. We follow strict protocol regarding operation theatre traffic, priority for shunt surgery as the first surgery of the day and strict aseptic precautions.

### **Conclusion**

Strict aseptic protocols followed by many neurosurgical centres have reduced the shunt infection rates considerably. In our experience we found that keeping the surgery time less than 20 mins along with routine strict aseptic precautions can reduce the risk of shunt infections further more than what is reported in the literature.

## **EVALUATION OF SYNTHETIC VERSUS AUTOLOGOUS BONY GRAFT FUSION IN ACUTE THORACOLUMBER BURST FRACTURES**

Akram M. Awadalla, QASIM RAZA

### **Introduction**

In spinal practice, there is an ever present need to fuse bony elements of the spine. Autologous bone from the iliac crest or rib is often used for these purposes, but harvesting this bone necessitates the removal of the graft from another site. Moreover, grafts of autogeneic bone may be resorbed to a significant degree with time. These shortcomings have provided the impetus for the use of bone substitutes in spinal surgery.

### **Objective**

It aimed to evaluate the efficacy of reinforcing short-segment pedicle screw fixation with postero-lateral fusion with synthetic bone substitute in thoraco-lumbar burst fracture.

### **Patients and methods**

We enrolled 48 patients with thoraco-lumbar burst fractures for treatment with short-segment pedicle screw fixation. Group A (N=23) were reinforced with postero-lateral fusion with synthetic bone substitute during surgery. Group B (N=25) underwent pedicle screw fixation and postero-lateral fusion with cancellous iliac bone graft. The radiographic and clinical results were compared between the two groups.

### **Results**

In both groups, no significant difference in terms of solid bony fusion nor clinical symptoms or radiological evidences of spinal instability. Patients in group A had short duration of surgery, less blood loss and short hospital stay as compared to patients in group B. The Frankel performance scale scores increased by nearly 1 in both groups. Group A had more patients with no pain, minimal or occasional pain (grade P1 or P2) than group B [ 86 % (n=20) vs. 44% (n=11) ]. One patient (4.3%) of group A and 6 patients (24%) of group B had severe and constant pain (grade P4, P5) ( $P < 0.001$ , two tailed Fischer's exact test ).

### **Conclusion**

The synthetic bone substitutes are effective graft materials in postero-lateral thoracolumbar spine fusion. They are available in unlimited quantities and associated with no donor site morbidity.

Key words: Burst fractures , posterior instrumentation , synthetic bone substitute , postero-lateral fusion.

## **LOCATION DICTATES MAJOR SURGICAL COMPLICATIONS FOR INTRADURAL EXTRAMEDULLARY SPINAL TUMORS**

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### **Introduction**

Complication rates associated with intradural extramedullary (IDEM) spinal tumors may vary depending on the level of the tumor, and its anterior, posterior, or lateral location in respect to the spinal cord.

### **Methods**

We performed a retrospective review of 98 consecutive patients ranging in age of 7 to 87 years old (mean 49.9 years) with an intradural extramedullary spinal tumor resection in the cervical and thoracic regions between February 2000 to July 2009. The patients had preoperative images (MRI and CT) and were categorized as anterior, posterior, or lateral. Complications were assessed through patient's hospital chart, progress notes, and last neurological exam during latest follow up.

### **Results**

Amongst patients with IDEM spinal tumors, 41.6% of all anterior tumors (n=12), 4.4% of all lateral tumors (n=69), and 0% of all posterior located tumors (n=17) demonstrated significant approach related surgical complications. Although no statistical difference was noted in the frequency of tumors occurring at any particular level in the spine (p=0.98), surgical approach related major complications were 4.5% at O-C3 (n=22), 0% at C4-C7 (n=16), 23.7% at T1-T4 (n=21), 5% at T5-T8 (n=20), and 0% at T9-T12 (n=20). Postoperative major neurologic deficits were sustained at last follow up appointment at least one year postoperatively. Major neurological deficits were seen in only anterior spinal cord tumors (3 patients of 12 total patients or 25%). All major neurological deficits occurred from T1-T5, where 2 of 21 patients or 9.5% of T1-T4 tumors and 1 of 20 or 5% of T5-T8.

### **Conclusion**

Spinal intradural extramedullary (IDEM) tumors that are anteriorly located in the upper thoracic spine have a significant approach related complication rate. More specifically major neurological deficit postoperatively was seen in only anterior T1-T5 spinal cord tumors. These findings might be associated with the unforgiving anatomy of the upper thoracic spine with a higher cord to canal ratio and decreased blood supply.

## **RADIOGRAPHIC LOCATION CHARACTERISTICS OF INTRADURAL EXTRAMEDULLARY SPINE TUMORS**

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*Financial disclosure:* the authors have no financial interests in the techniques described.

*Key words:* Extramedullary Spinal Tumors, Meningioma, Neurofibroma, Schwannoma

### **Introduction**

Determining the pathology of an intradural extramedullary (IDEM) spinal tumor from radiographic location on MRI continues to be challenging. Our retrospective study attempts to determine if location dictates pathology in IDEM spinal cord tumors.

### **Methods**

We performed a retrospective review of 98 consecutive patients ranging from 7 to 87 years old (mean age 49.9 years) who presented with an intradural extramedullary spine tumor in the cervical and/or thoracic regions and underwent resection between February 2000 and July 2009.

### **Results**

Across a combination of all IDEM tumors in the cohort, there was roughly similar tumors at each level analyzed ( $p=0.98$ ; Figure 1). Axial location was predominantly lateral at 70%, compared to 12.5% anterior and 17.7% posterior. The axial location of IDEM was not significantly different when assessed at different levels ( $p=0.32$ ; Figure 2). Meningiomas were equally distributed along 4 quadrants with 19.5% anterior, 24.4% posterior, and 56.1% lateral (2 quadrants). The plausible reason there is a roughly equal distribution of tumors in all 4 quadrants is that meningiomas arise from arachnoid cap cells in the arachnoid layer of the meninges, and there is an equal distribution of meninges around the spinal cord. Schwannomas and neurofibromas are lateral in position towards the nerve roots with 83.8% and 88.2% respectively. The pathology of anterior IDEM tumors are predominantly meningiomas with 72.7%, and the rest 27.3% were schwannomas. From analyzing the preoperative films on these anterior schwannomas, it was noted that the patients had large growing tumors that started laterally and pushed the spinal cord posteriorly. Neurofibromas occur at a higher frequency rostrally: O-C3 (41.2%), C4-C7 (29.4%), T1-T4 (11.8%), T5-T8 (11.8%), and T9-T12 (5.9%). Schwannomas do not significantly differ from based on level.

### **Conclusion**

Preoperative radiographic location from our series of 98 patients suggests a

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correlation between location and pathology. Meningiomas are shown to occur equally in all four axial quadrants of the spinal cord. Anterior tumors are more likely meningiomas compared to schwannomas with a rate of 3:1. Neurofibromas occur more frequently rostral and lateral but do not occur anteriorly.

Tumor Pathology	Patients	Anterior	Posterior	Lateral
Meningioma	41 (42.7%)	9 (19.5%)	10 (24.4%)	23 (56.1%)
Schwannoma	31 (32.3%)	3 (9.7%)	2 (6.5%)	26 (83.8%)
Neurofibroma	17 (17.7%)	0 (0.0%)	2 (11.8%)	15 (88.2%)
Epidermoid/Dermoid	3 (3.1%)	0 (0.0%)	0 (0.0%)	3 (100%)
Arachnoid Cyst	4 (4.2%)	0 (0.0%)	3 (75.0%)	1 (25.0%)
<b>Total</b>	<b>96 (100%)</b>	<b>12 (12.5%)</b>	<b>17 (17.7%)</b>	<b>67 (70.0%)</b>

Table 1: Extramedullary Tumor Location

Tumor Pathology	Patients	Anterior	Posterior	Lateral
Meningioma	41 (42.7%)	9 (19.5%)	10 (24.4%)	23 (56.1%)
Schwannoma	31 (32.3%)	3 (9.7%)	2 (6.5%)	26 (83.8%)
Neurofibroma	17 (17.7%)	0 (0.0%)	2 (11.8%)	15 (88.2%)
Epidermoid/Dermoid	3 (3.1%)	0 (0.0%)	0 (0.0%)	3 (100%)
Arachnoid Cyst	4 (4.2%)	0 (0.0%)	3 (75.0%)	1 (25.0%)
<b>Total</b>	<b>96 (100%)</b>	<b>12 (12.5%)</b>	<b>17 (17.7%)</b>	<b>67 (70.0%)</b>

Table 2: Demographics Ages of Population

## **SPLIT CORD MALFORMATIONS**

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### **Objective**

Split Cord Malformations are rare and complex group of congenital malformation with a wide range of clinical manifestation and outcome. It may be incidentally detected on examination or may manifest with severe neurological deficits. It is important to suspect this rare malformation in the select group of patients and subject them to imaging to diagnose and treat the patients before permanent deficits manifest.

### **Material and methods**

22 patients between the age group of 1 year to 14 years were examined and treated over 7 years. 13 (61%) were males and 8 were females. 8 were Type 1 and 14 were Type 2. All patients were symptomatic at the time of presentation. They were investigated with MRI and CT scan. All the patients underwent surgery for detethering and excision of bony or fibrous spur.

### **Results**

Overall 17 patients improved in symptoms or arrest of further progression of symptoms. Patients who had presented early in the course of disease had a better outcome. Involvement of bladder function was an indicator of poor outcome.

### **Conclusion**

Split cord malformations are rare and under diagnosed. The patients suspected to have skin signatures need to undergo screening and picked up before deficits set in. Involvement of sphincter is an indicator of poor functional outcome.

## **IMAGE-GUIDED PLACEMENT OF S2 SACRO-ILIAC SCREWS AS DISTAL FIXATION IN SPINAL DEFORMITY SURGERY**

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### **Background context**

Achieving fusion across the lumbosacral junction is challenging due to the unfavorable biomechanics associated with ending a long segment construct at this level. Bicortical placement of S1 pedicle screws can increase the construct stability at the lumbosacral junction; however, construct failure and pseudoarthrosis can still result. Iliac screws have been shown to increase the stiffness of lumbosacral constructs, but disadvantages include difficulty in connecting the iliac screw to adjacent sacral screws, painful screw loosening or prominence requiring removal and the inability to place the screws in some patients with previous iliac crest autograft harvest.

### **Purpose**

To describe a technique of S2 sacro-iliac screw placement utilizing three-dimensional (3D) image guidance.

### **Study design/setting**

Retrospective analysis

### **Patient sample**

10 patients undergoing lumbopelvic fusion had 19 screws placed using this technique.

### **Outcome measures**

An independent radiologist graded screw placement on thin-cut, postoperative computed tomographic (CT) scans.

### **Methods**

Image guidance in this study was accomplished with the Medtronic Stealth Station Treon (Medtronic Inc., Littleton, Massachusetts) used in conjunction with the O-ARM (Medtronic Inc.). Indications for placement of S2 sacro-iliac screws included: 1). to adjunct S1 pedicle screws in multilevel fusion cases in patients with spinal deformity. 2). as an adjunct to S1 pedicle screws in pseudoarthrosis revision cases in which the S1 screws had loosened. 3). a combination of the above. The entry point of the screw was typically chosen lateral and superior to the S2 dorsal foramen with the trajectory directed anterior, slightly inferior and lateral. Attempt was made to place the screw through the lateral sacral cortex, sacro-iliac (SI) joint and medial iliac cortex

with the tip extending into the cancellous bone of the ileum. An independent radiologist graded the placement of the screws on the intraoperative CT scan obtained with the O-ARM or on postoperative CT scans.

### **Results**

No complications occurred in this study as a result of S2 sacro-iliac screw placement with image guidance. All S2-iliac screws were successfully placed traversing the SI joint and ending with the tip in the ileum. No neuroforaminal encroachment was noted with any of the screws.

Conclusions: 3D image guidance allows for safe placement of large S2 sacro-iliac screws that can provide additional biomechanical stability to lumbosacral constructs. The tricortical placement of these screws allows for more robust distal fixation. Placement with the starting point at S2 may eliminate the tender prominence of iliac screws and the need for offset connectors. Biomechanical and long-term outcome studies are currently underway, but are incomplete at this time.

### **Key words**

Spinal navigation, image guidance, sacro-iliac screw, computer assisted, lumbosacral fusion, instrumentation, spinal deformity surgery

## **NONFUSION DYNAMIC FIXATION OF THE DEGENERATED LUMBAR SPINE**

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### **Background**

The surgical treatment of degenerative lumbar spine diseases may require the transpedicular fixation together with fusion in order to achieve the rigid stability of the affected motion segment. The spondylodesis may lead to adjacent segments degeneration, therefore the development of the new dynamic systems, needing no fusion, occurred.

The aim of the study was to determine clinical results and the outcome in the patients treated for lumbar spondylolisthesis using the dynamic transpedicular fixation system.

### **Methods**

In the study, 40 patients with the painful, stable lumbar spondylolisthesis (Grade I) were treated with the dynamic transpedicular fixation system – Cosmic (Ulrich GmbH & Co. KG). Overall 53 levels from L2 to S1 were treated in these patients. Clinical outcomes were assessed before and one year after the procedure using neurological examination, the Oswestry Disability Index (ODI) and Visual analogue score (VAS) for back and leg pain, with 15 % improvement in ODI and 20 % in VAS defined as a clinically significant.

### **Discussion and results**

Cosmic is a posterior nonfusion dynamic implant system, featuring hinged screws which are coated with bioactive calcium phosphate to improve anchoring in the bone and connected adjacently with the rod, providing good rotational stability. Stabilization with this system and without spinal fusion reduces the surgical trauma, shortens the time of the surgery, avoids the pain from the bone extraction site and preserves the intervertebral disc and its function.

Forty patients with the stable lumbar spondylolisthesis, treated with the Cosmic system were included in the study with a minimum follow-up of one year. There was a significant improvement for back and leg pain according to ODI (74.3% of patients in the group achieved  $\geq 15\%$  improvement) and VAS score.

### **Conclusions:**

The Cosmic as a dynamic non-fusion fixation system represents the new step in the spinal instrumentation and can efficiently replace the classis spondylodesis in the treatment of painful stable spondylolisthesis (Grade I) of the lumbar spine. Long-term follow-up studies will determine the definitive treatment.

## **IMMEDIATE SINGLE-STAGE RECONSTRUCTION OF COMPLEX FRONTOFACIOBASAL INJURIES**

Akram M. Awadallala, Hichem Ezzeddine, Nagla F. Mohamed

### **Objectives**

The purpose of this prospective study was to determine if immediate( within 6 hours) single-stage repair of complex craniofacial injuries could be accomplished with acceptable morbidity and mortality taking into consideration the cosmetic appearance of the patient.

### **Patients and method**

In this study, 26 patients (19 men, 7 women) ranging in age from 8 to 58 years, with Glasgow Coma Scale scores of 5 to 15, all had a combined single-stage repair of their complex craniofacial injuries within 6 hours of their admission. After initial assessment and resuscitation, all patients were evaluated with computerized tomography of the face and head before surgery with special 1-mm thin slices , coronal cuts and 3-D reconstruction. Bicoronal skin flap was used for maximum exposure for frontal sinus exenteration as well as dural repair, cortical debridement, calvarial reconstruction and titanium mesh placement .Dural grafts were necessary in 22 of 26 patients (85%), and supplementary bone grafting was required in 19 of 26 patients (73%), of which 6 patients (23%) had iliac bone grafts, whereas split calvarial grafts were used in 12 patients (46%) and a full thickness calvarial graft was used in one case (3.8%). Miniplates, screws and titanium mesh were used to fix and improve the aesthetic appearance.

### **Results**

Neurosurgical outcome at both early and late evaluation was judged as good in 22 of 26 patients (85%) , moderate in 3 of the 26 (11%) and poor in 1 of the 26 (3.8%). Cosmetic surgical outcome at early evaluation showed 17 of 26 (65%) to be excellent, 4 of 26 (15.5%) to be good, 4 patients (15.5%) to be fair , and one patient (3.8%) to be poor . At late reevaluation, the fair had improved to good with only one additional reconstructive procedure and the poor had improved to fair with another surgery. There were no calvarial osteomyelitis, graft resorption, or intracranial abscesses. Complications included 3 patients (11%) ,one case (3.8 %) had tension pneumocephaly and meningitis , one case (3.8%) had delayed cerebrospinal fluid leak with recurrent attacks of meningitis and One case of Maxillary sinus infection (3.8 %) secondary to front-maxillary fistula associated with wound infection and hardware exposure .These results compare favorably with historical data in which an overall infection rate for a staged repair would be 12.5 to 17.7%.

**Conclusion**

We conclude that immediate single-stage repair of complex craniofacial injuries can be performed with an acceptable rate of morbidity and mortality, a decreased need for reoperation, and an improved cosmetic and functional outcome.

**Key words**

Craniofacial fracture, orbital trauma, bone graft, titanium mesh.

## **IMPACT FACTOR ANALYSIS OF POST-OPERATION LIFE QUALITY ACCORDING TO KPS IN ADULT SUPRATENTORIAL SUPERFICIAL LOW-GRADE GLIOMA**

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### **Objective**

We assessed the life quality of adult supratentorial superficial low-grade glioma (ASS-LGG) patients according to Karnofsky Performance Scale (KPS) and analyzed the relevant factors. Some benefit factors were found through this research to guide the therapeutic strategy and improve the patients' prognosis after glioma surgery.

### **Method**

One hundred and four adults with ASS-LGG were collected and analyzed retrospectively from 2008 to 2009. The follow-up time was from three months to half of a year. The logistic regression was used to discuss the relationship between the life quality after surgery according to KPS and the impact factors such as age, gender, operation time, size and location of the tumor, degree of resection, and tumor grade before surgery.

### **Result**

We found that four out of ten candidate factors have pertinence with the improvement of the life quality after surgery. They are age more than 40 years, the size of tumor less than 5cm, tumor located in the right hemisphere and limited resection of tumor in functional area.

### **Conclusions**

It's seems more significant to judge ASS-LGG patients' prognosis on the base of life quality because of the patients' long-time survival. To ASS-LGG patients, we could predict the life quality according to KPS after surgery depending on the patients' age, and size and location of the tumor. It is benefit to the improvement of life quality if the tumor is resected at early stage. Relieving the size of the tumor and acquiring the pathological diagnosis should be recommended instead of the en bloc resection in functional area.

### **Keywords**

Life quality; low-grade glioma; adult supratentorial superficial; surgical therapy; Karnofsky Performance Scale (KPS); impact factor

## **EPIDEMIOLOGICAL FEATURES OF THE BRAIN TUMORS IN THE SOUTH REGION OF THE REPUBLIC OF UZBEKISTAN**

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The study of the prevalence of the different diseases among population presents a big scientific and practical interest. We in the accessible to literature could not find randomized trials regarding epidemiology of the tumors of the central nervous system in the South region of the Republic of Uzbekistan.

For the last 10 years in our clinic it was surgical operated 343 patients with primary (248 patients) brain tumors and recurrent tumors 95 patients. Among recurrent tumors in 77 patients we determined neuroectodermal tumors and in 18 patients we determined meningo-vascular tumors.

Distribution of the patients with brain tumors among regions showed that in clinic there were 95 patients from Samarkand region, 73 patients from Kashkadarya region, 85 patients from Surhandarya region, 23 patients from Navoi region and 67 patients from Jizzah region.

Among received and operated patients in our clinic from the regions which were pointed above there were not any differences. But on the other hand from Samarkand region in 2009 it was received in 2 times more patients with brain tumors in the comparison from 2000. From Surhandarya and Kashkadarya regions it was received in 1,5 times more patients with brain tumors in the comparison from 2000. From Jizzah region it was noted some decreasing amount of patients with brain tumors in 2009 in comparison from 2000.

These data were telling us not only about the increasing number of the brain tumors, but also about the high operational activity of our neurosurgeons in our clinic.

## **TO THE QUESTION REGARDING HISTOLOGICAL FEATURES OF THE BRAIN TUMORS**

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Histological data of the brain tumors causes a big interest among specialists who work on the problems of neurooncology since exactly to determine the character of the brain tumors could allow us to choose correctly treatment tactics in the postoperative period and to carry out rehabilitation.

The carried out by us the analyses of the histological features of the brain tumors in 238 patients who were treated in the neurosurgical department of the Samarkand medical institute from 2002 to 2008 showed that the most often we examined neuroectodermal tumors – in 126 patients (52,9%), the second place it was taken the tumors of the brain membrane – in 91 patients (38,2%), the third place it was taken the tumors of the skull bones – in 11 patients (4,6%), then we examined cholesteatomas – in 6 patients (2,6%) and neurinomas – in 4 patients (1,7%).

According to the most common morphological classification of the neuroectodermal brain tumors the pointed from the above tumors were structurally divided into the following order: aplastic astrocytomas – in 57 patients (23,9%), pilloid astrocytomas – in 21 patients (8,8%), medulloblastomas – in 13 patients (5,5%), protoplasmatic astrocytomas – in 12 patients (5,1%), glioblastomas – in 11 patients (4,6%), fibril astrocytomas – in 9 patients (3,7%) and ependiomas – in 3 patients (1,3%).

Meantime, patients with tumors growing from the brain membranes were 38,2%, then it was patients with tumors of the skull bones (4,6%), less we examined patients with cholesteatomas (2,4%) and neurinomas of the hearing nerve (1,7%). To clarification these features of the brain tumors could allow us to determine tactics and volume of the treatment in the postoperative period.

## **OUTCOME ANALYSIS OF ANEURYSMAL SAH IN YOUNG ADULTS – A RETROSPECTIVE COMPARISON BETWEEN THE POOR AND GOOD GRADES ON GLASGOW OUTCOME SCALE**

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### **Objectives**

Aneurysmal SAH is deemed to be a rare occurrence in young adults. Also to date, little has been studied about the aneurysm in this age group. The young age is recognized as the prognostic factor of good outcome. The aim of this study was to determine the incidence of SAH in young adults and to compare the various clinical and prognostic parameters to the Glasgow outcome scale (GOS).

### **Methods**

A total of 117 patients of 1188 patients admitted between 1990 and 2007 were classified as young adults. We retrospectively reviewed and recorded the clinical parameters such as age, gender, hypertension, smoking, location of cerebral aneurysm, size of the aneurysm, Hunt Hess and Fischer grading on presentation in each young adult. Outcome was measured by means of Glasgow outcome scale at discharge and at 2 year follow-up. The outcome was dichotomized as good/favorable (GOS grade 4 and 5) or poor (GOS grade 1 and 2). Analysis was mainly focused on the comparison of each of these parameters to the Glasgow outcome scale.

### **Results**

The incidence of SAH in young adults was 9.8% in this study, which is slightly lower, compared to incidence in general population. There was a significant correlation between the Fischer grading scale ( $p = 0.048$ ), Hunt Hess scale ( $p = 0.001$ ) and outcome. No correlation was found in between other parameters and the grades of the GOS. Perioperative vasospasm, hydrocephalus, intraventricular hemorrhage and intracerebral hemorrhage rate was 31.4%. The patients with grade 2 on discharge showed significant improvement - 50% showed favorable outcome and 50% were stable, on the 2 year follow up GOS. However, these were not correlated to other clinical parameters.

### **Conclusions**

Evaluation of result in present clinical series suggests that there is no relation between the Glasgow outcome scale grades and the clinical parameters. Outcome is related to the well established clinical factors such as Hunt Hess and Fischer grades. Generally, a satisfactory outcome was obtained and significant continuing improvements were noted between discharge and 2 year follow-up evaluation.

## TELEMETRIC ICP HOME MONITORING WITH A NEW SYSTEM

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### Objective

No reference values for telemetric ICP home monitoring exist so far. For the first time, we have now the possibility to measure the ICP in a safe and reliable home monitoring setting. Here we report on indications for telemetric ICP home monitoring, first long-time results and therapeutical consequences in neurosurgery.

### Methods

The telemetric long time home measurement was performed in 19 patients (mean 16,7y, range 2-56y) over a mean of 65 days (range 8-209 d). The intraparenchymal ICP probe was applied over a small burrhole, the telemetric transducer was placed under the galea. Parents were trained in the handling of the data storage and monitoring system (Raumedic AG, Helmbrechts, Germany).

A diary for headache or adverse events was kept by the patients or parents. The long-term data were analysed weekly up to a monthly interval. All data were statistically analyzed using SPSS and Windows Excel 2007.

### Results

Between January and December 2010 the new system was successfully applied in all 19 patients without complications. The indications for implantation of the new telemetric ICP probe were suspected hydrocephalus, control of sufficiency of ETV, shunt ligation and suspected shunt dysfunction, severe head trauma and craniosynostosis. In five patients the measurement is still ongoing. In 11 patients, normal ICP values could exclude pathological ICP and further surgical measures could be avoided; in eight patients, repeated plateaus of raised ICP indicated ETV, shunt operation or decompressive craniotomy - resulting in a normalization of ICP.

### Conclusion

This new technology allows the physician a first reliable and patient-friendly long-term ICP home monitoring. As a diagnostic tool, the telemetric monitoring resulted in faster identification of pathologic ICP patterns and consequently more efficient and faster neurosurgical management. In all patients, a correct diagnosis could be made; further neurosurgical interventions could be either avoided (when ICP was normal), or, where surgical interventions were necessary, the normalization of postoperative ICP could be proved in all cases.

## **THE IMPORTANCE ENDOLUMBAL OZONE AND NOOTROPIC INSUFFLATION DURING THE POSTOPERATIVE PERIOD AFTER EVACUATION OF POSTTRAUMATIC ARACHNOIDAL CYSTS**

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During the development of techniques and civilization traumatism, especially the increasing frequency of neurotraumatism is the actual problem for the present time. Among the general amount of traumas craniocerebral traumas (CCT) take 30-40% and it takes the first place in the developing of mortality and disability rates in the capable of working people before 44 years old. As the most complications after CCT, posttraumatic cerebral arachnoiditis (PCA) develops in 60-70% of cases and it can cause full or partial limitation of working abilities. According to the literature review in 30% of patients PCA could be presented as a cystic character.

We have observed the effectiveness of the surgical treatment and rehabilitation in the postoperative period in 38 patients with cystic PCA who were treated from 2006-2009 years in the neurosurgical clinic of Samarkand State Medical Institute.

Among patients there were 27 men (71,05%) and 11 women (28,95%). According to the age the observed data was in the following order: from 1,5 to 15 years old there was 5 patients (13,2%), from 15 to 30 years old there was 13 patients (34,2%), from 30 to 40 years old there was 18 patients (47,3%) and from 40 to 50 years old there was 2 patients (5,3%). In order to do the neurovisualization in 29 patients (76,3%) it was performed computer tomography and in 9 patients (23,7%) it was performed magnet-resonance imaging. Due to the localization posttraumatic arachnoidal cysts in 11 patients (28,9%) it has determined on the parietal area, in 7 patients (18,4%) it has determined on the frontal area, in 6 patients (15,8%) it has determined on the temporal area, in 6 patients (15,8%) it has determined on the brain basis (temporal and frontal mediobasal areas), in 5 patients (13,2%) it has determined in the posterior area of the cranium and in 3 patients (7,9%) it has determined on the occipital area.

According to the diameter the distribution was in the following order: the diameter 1,5-2,5 cm small cysts have determined in 4 patients (10,5%), the diameter 2,5-4,5 cm moderate cysts have determined in 9 patients (23,7%) and the diameter 4,5 cm large cysts have determined in 25 patients (65,8%).

As basic indications for operation it was the effectiveness of conservative treatment of epileptic attacks, enhancement hypertension-hydrocephalic syndrome, appearing and enhancement of the local symptoms and disorders of liquor circulation. All observed patients were suffered from the different characters of the epileptic attacks.

To all patients it was performed surgical operations such as incision of the cyst's wall and restoration of liquor circulation.

According to the treatment tactic in the postoperative period all patients were divided into two groups. In the first group there were 23 patients to whom in the

postoperative period it was performed endolumbal insufflation of ozone and nootropic mixture in order to avoid the development of adhesions. In the second group there were 15 patients to whom in the postoperative period it was performed parenteral injection of the nootropic drugs. To the both groups in the postoperative period it was performed antiepileptic drugs such as valproates (convulex), finlepsin, benzonal and lamitor.

During the study of the patients' catamnesis in 19 patients (82,6%) from the first group epileptic attacks were stopped, in 3 patients (13,1%) epileptic attacks were in the mild degree and almost stopped and in the left 1 patient (4,3%) epileptic attacks were the same as we have examined before the surgical operation.

In 5 patients (33,3%) from the second group epileptic attacks were not examined, in 6 patients (40%) epileptic attacks were in the mild degree and almost stopped and in the left 4 patients (26,7%) the beginning and the type of epileptic attacks were unchanged.

So, the use of endolumbal ozone and pyracetam insufflation in the postoperative period (7-8 days) in patients with posttraumatic arachnoidal cysts could prevent the development of adhesion process and the recurrence of adhesions and in the most cases (82,6%) it could stop epileptic attacks. Also in some patients the epileptic attacks were carried out in the mild degree and it could increase the effectiveness of the treatment.

## **SPONTANEOUS RUPTURE OF AN ADENOCARCINOMA CYST METASTATIC TO THE BRAIN**

O. Lermen, V. Marneffe, A. Tyberghien, M. Triffaux

Neurosurgical Department Clinique St Pierre Ottignies, Ottignies, Belgium

### **Introduction**

Adenocarcinoma cyst rupture is well known and described in abdominal pathology and can occur in lesions located in different internal organs. We describe the first case of cyst rupture of a cerebral adenocarcinoma metastasis.

### **Material and methods**

*Case report. Literature review.*

We describe the case of a 63 year old female patient suffering of metastatic pulmonary adenocarcinoma revealed by focal neurological deficits. Cerebral imaging studies reveal a right frontal cystic tumor neighbouring the lateral ventricular wall. Systemic workup showed further the presence of a primitive pulmonary lesion with hepatic metastases as well. Six days after hospitalisation the patient suddenly worsened her neurological status. CT scanner of the brain showed a smaller and more hypodense cyst indicating rupture into the lateral ventricle which resulted in a chemical meningitis and meningeal dissemination of the tumor. To alleviate residual mass effect and obtain a histological sample a resection of the tumor was carried out. After initial recovery the patient suffered secondary cerebral infarctions and died six weeks after diagnosis of multiple medical complications

Literature review does not show any reported cases of this kind although adenocarcinoma cyst rupture seems to be a well known scenario in abdominal pathology.

### **Results**

This case illustrates the possibility of cyst rupture of metastatic cerebral adenocarcinoma. We hypothesize two risk factors for cyst rupture : lesion size and proximity to CSF containing spaces, in particular ventricles. Cyst rupture in our case not only has provoked tumor dissemination but also chemical meningitis due to mucus contaminating the ventricles.

### **Conclusion**

We would like to attract attention to this rare but potentially devastating complication of cystic adenocarcinoma metastases to the brain. Risk factors may be the size of the lesion as well as its proximity to CSF spaces. If surgery is indicated, these patients should be rapidly operated on to avoid this severe complication.

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**Background**

The University of New Mexico Hospital (UNMH) is the only Level I trauma center in the state of New Mexico with dedicated traumatic brain injury (TBI) care. Many of these beds are occupied by patients transferred that could have been cared for locally. Here we report our experience with managing acute mild head trauma in remote and rural locations with teleradiology.

**Methods**

In an effort to promote safe management and quality care of the mild traumatic brain injured (mTBI) patient at a local level, a teleradiology system has been implemented through collaboration between Indian Health Service (IHS) and UNMH. Data on patient outcome and utilization of teleradiology from January 2010 to November 2010 was retrospectively reviewed.

**Results**

Between January 2010 and November 2010, 70 head CT scans were reviewed on IMedCon. Thirty six patients had a diagnosis pertaining to TBI. Ten head CT scans were negative. The remaining 26 patients had pathology that included: Epidural (n=1) and subdural (n=11) hematomas, traumatic subarachnoid hemorrhage (n=12), contusion (n=5), intraparenchymal (n=3) and intraventricular bleeds (n=1). Of the 26 scans reviewed, 62% (n=16) patients were treated locally and 38% (n=10) were transferred to a Level I trauma center.

**Conclusion**

Teleradiology is feasible in rural areas to facilitate triage of patients with mTBI.

## **ANTERIOR CERVICAL DISC SURGERIES**

Dr.Hariprakash and Dr.M.Balamurugan

### **Abstract**

Implants and prosthesis has led to evolution in anterior disc surgeries from conventional anterior cervical fusion procedures to placement of artificial spacers to motion preservation surgery like cervical arthroplasty. Motion segment analyses in cervical arthroplasties have reported a motion preservation of around 5 degrees. The positive impact of motion preservation surgery on the activities of daily living has been studied in the western population. The applicability of these results in context to a emerging economy like India, is studied.

### **Objective**

To compare impact of anterior cervical fusion with bone grafts, spacer placement and cervical arthroplasty, on activities of daily living in Indian subjects and the implications of the cost of treatment in these three groups.

### **Materials and methods**

Its retrospective case control study of 240 patients who underwent different surgeries for cervical disc disease during the period of January 2005 till January 2009. We compared the activity of daily living using an innovative scale devised for the study population. The cost of the different procedures was compared. The Minimum follow up period was 1 year.

### **Results**

126 patients anterior cervical discectomy and bony fusion (ACDF), 39 patients under cervical arthroplasty, 75 patients underwent anterior cervical discectomy and spacer placement. At the follow up period of 1 year we did not find any significant difference in the activity of daily living among these three groups. The patients who underwent spacer placement and the patients who underwent arthroplasty had a quicker post operative recovery when compared to ACDF group. The cost surgeries remained significantly different, with average cost per surgery for ACDF being 60000/-Rs, placement of spacer being 70000/- Rs and cervical arthroplasty being 120000/-Rs.

### **Conclusion**

The use of implants in an emerging economy like India remains a difficult decision, keeping in mind the different level of activities which in part depends on the socioeconomic strata the patient belongs to. In our opinion the possible clinical benefits due to different surgical procedures could have been masked due to a relative small cohort.

## **NONFUSION DYNAMIC FIXATION OF THE DEGENERATED LUMBAR SPINE**

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### **Background**

The surgical treatment of degenerative lumbar spine diseases may require the transpedicular fixation together with fusion in order to achieve the rigid stability of the affected motion segment. The spondylodesis may lead to adjacent segments degeneration, therefore the development of the new dynamic systems, needing no fusion, occurred.

The aim of the study was to determine clinical results and the outcome in the patients treated for lumbar spondylolisthesis using the dynamic transpedicular fixation system.

### **Methods**

In the study, 40 patients with the painful, stable lumbar spondylolisthesis (Grade I) were treated with the dynamic transpedicular fixation system – Cosmic (Ulrich GmbH & Co. KG). Overall 53 levels from L2 to S1 were treated in these patients. Clinical outcomes were assessed before and one year after the procedure using neurological examination, the Oswestry Disability Index (ODI) and Visual analogue score (VAS) for back and leg pain, with 15 % improvement in ODI and 20 % in VAS defined as a clinically significant.

### **Discussion and results**

Cosmic is a posterior nonfusion dynamic implant system, featuring hinged screws which are coated with bioactive calcium phosphate to improve anchoring in the bone and connected adjacently with the rod, providing good rotational stability. Stabilization with this system and without spinal fusion reduces the surgical trauma, shortens the time of the surgery, avoids the pain from the bone extraction site and preserves the intervertebral disc and its function.

Forty patients with the stable lumbar spondylolisthesis, treated with the Cosmic system were included in the study with a minimum follow-up of one year. There was a significant improvement for back and leg pain according to ODI (74.3% of patients in the group achieved  $\geq 15\%$  improvement) and VAS score.

### **Conclusions**

The Cosmic as a dynamic non-fusion fixation system represents the new step in the spinal instrumentation and can efficiently replace the classis spondylodesis in the treatment of painful stable spondylolisthesis (Grade I) of the lumbar spine. Long-term follow-up studies will determine the definitive treatment.

## **SYMPTOMATIC PNEUMOCEPHALUS ASSOCIATED WITH LUMBAR DURAL TEAR AND REVERSE TRENDELENBURG POSITIONING: CASE REPORT AND REVIEW OF THE LITERATURE**

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### **Background context**

Symptomatic pneumocephalus is a rare complication of degenerative lumbar spine surgery.

### **Purpose**

To inform spine surgeons of potential major complications with common occurrences that can be mitigated with simple adjustments.

### **Methods/design**

This is a case report of a patient who developed transient diplopia associated with pneumocephalus following lumbar spine surgery complicated by a dural tear. The diplopia improved as the pneumocephalus resolved.

### **Results**

Factors involved in the development of pneumocephalus include an unintended durotomy and reverse Trendelenburg positioning that was utilized to decrease the risk of post-operative vision loss.

### **Conclusions**

When encountering cerebrospinal fluid (CSF) leakage intraoperatively, spine surgeons should level the operating table until closure of the dural defect to prevent potential complications associated with pneumocephalus. If post-operative patients complain of severe headaches or display a focal cranial neurologic deficit, then a computed tomography (CT) scan of the brain should be ordered and evaluated.

### **Key words**

Pneumocephalus, dural tear, cerebrospinal fluid leakage, blindness associated with spine surgery, degenerative spine surgery.

## **SPONTANEOUS RUPTURE OF AN ADENOCARCINOMA CYST METASTATIC TO THE BRAIN**

O. Lermen, V. Marneffe, A. Tyberghien, M. Triffaux

Neurosurgical Department Clinique St Pierre Ottignies, Ottignies, Belgium

### **Introduction**

Adenocarcinoma cyst rupture is well known and described in abdominal pathology and can occur in lesions located in different internal organs. We describe the first case of cyst rupture of a cerebral adenocarcinoma metastasis.

### **Material and methods**

*Case report. Literature review.*

We describe the case of a 63 year old female patient suffering of metastatic pulmonary adenocarcinoma revealed by focal neurological deficits. Cerebral imaging studies reveal a right frontal cystic tumor neighbouring the lateral ventricular wall. Systemic workup showed further the presence of a primitive pulmonary lesion with hepatic metastases as well. Six days after hospitalisation the patient suddenly worsened her neurological status. CT scanner of the brain showed a smaller and more hypodense cyst indicating rupture into the lateral ventricle which resulted in a chemical meningitis and meningeal dissemination of the tumor. To alleviate residual mass effect and obtain a histological sample a resection of the tumor was carried out. After initial recovery the patient suffered secondary cerebral infarctions and died six weeks after diagnosis of multiple medical complications.

Literature review does not show any reported cases of this kind although adenocarcinoma cyst rupture seems to be a well known scenario in abdominal pathology.

### **Results**

This case illustrates the possibility of cyst rupture of metastatic cerebral adenocarcinoma. We hypothesize two risk factors for cyst rupture : lesion size and proximity to CSF containing spaces, in particular ventricles. Cyst rupture in our case not only has provoked tumor dissemination but also chemical meningitis due to mucus contaminating the ventricles.

### **Conclusion**

We would like to attract attention to this rare but potentially devastating complication of cystic adenocarcinoma metastases to the brain. Risk factors may be the size of the lesion as well as its proximity to CSF spaces. If surgery is indicated, these patients should be rapidly operated on to avoid this severe complication.

## **THE CLINICAL RESULTS OF COMBINED EXPANSIVE OPEN-DOOR LAMINOPLASTY BY SPINOUS PROCESSES SPLITTING AND SELECTIVE ANTERIOR SPINAL FUSION FOR THE TREATMENT OF SEVERE CERVICAL SPONDYLOTIC MYELOPATHY**

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### **Objective**

The purpose of this study was to evaluate the clinical results of combined expansive open-door laminoplasty by spinous processes splitting and selective anterior spinal fusion for severe cervical spondylotic myelopathy (CSM).

### **Methods**

From January 2008 to October 2009, A total of 28 patients underwent One-stage combined expansive open-door laminoplasty and selective anterior spinal fusion for severe CSM, including 16 men and 12 women. The average patient age was 63.1 years (range 52–67 years). The average duration of symptoms was 78 months (range 1 month to 16 years). The affected levels were double in 3 cases, three in 13 cases, and four in 12 cases, including C2/3 in 3 cases, C3/4 in 21 cases, C4/5 in 26 cases, C5/6 in 25 cases, and C6/7 in 16 cases. Four cases had high tension, and 5 cases had diabetes. The pre-operative JOA scores were  $10.5 \pm 2.1$ . The number of finger grip and release (G and R) in 10 seconds was  $10.8 \pm 1.0$ . The average power of gripping was 24.6kg. The Cobb angle of sagittal alignment (C2-C7) was 20.10. First, all patients underwent expansive open-door laminoplasty by spinous processes splitting. In C6/7 affected cases, the upper half laminectomy of C7 was performed; Second, anterior decompression and spinal fusion was performed. The decompression levels were determined according to the pre-operative clinical signs, MR image and CT scanning.

### **Results**

The mean operation time was  $6.5 \pm 1.1$ h, and blood loss was 533ml. The anterior decompression levels were one in 13 cases, two in 11 cases, and three in 4 cases. The postoperative MR images or CT scanning showed that the spinal canal decompression was complete in all cases without surgery-related complication. One-year follow-up was acquired in all cases. The post-operative JOA scores, recovery rate, number of G and R in 10 seconds and power of gripping were  $14.9 \pm 1.2$ ,  $(67.7 \pm 9.2) \%$ ,  $17.8 \pm 3.9$  and  $34.2 \pm 6.1$ kg, respectively. The JOA scores, number of G and R in 10 seconds and power of gripping were significantly improved ( $P < 0.05$ ). The Cobb angles of sagittal alignment (C2-C7 angle) was 22.10, which had no significant difference with pre-operative data.

**Conclusion**

Combined expansive open-door laminoplasty by spinous processes splitting and selective anterior spinal fusion can acquired complete spinal canal decompression. This surgical strategy was effective in improving the surgical outcomes of CSM, and short-term results.

**Key words**

Cervical Laminoplasty; Cervical Spondylotic Myelopathy; Anterior Decompression

**Point of abstract**

The purpose of this study was to evaluate the clinical results of combined expansive open-door laminoplasty and selective anterior spinal fusion for severe CSM. Twenty-eight patients were included. We found JOA scores, number of G and R in 10 seconds and power of gripping were significantly improved 1-year after surgery. Our strategy was effective in improving surgical outcomes of CSM.

## **THE RADIOGRAPHIC AND ANATOMIC MEASUREMENT OF C2 LAMINA IN CHINESE POPULATION**

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### **Object**

In this research, we performed the anatomical and CT measurement of C2 lamina in Chinese people in order to provide the anatomical and radiographic data and to verify the clinical applicability of trans-lamina screws in North Chinese people.

### **Methods**

A total of 96 human adult cadaver spines were included in our study (group A). There were 51 males and 45 females. The minimal height (H1), thickness (T), length (L1) of C2 lamina, height of the root of lamina (H2), distance from the entry point to the lateral rim of lamina (L2) and to the lateral rim of lateral mass (L3) were bilaterally measured using high precision calipers. The spinolaminar angles (angle A) were also included. A total of 112 volunteer without upper cervical abnormality were enrolled in this study (group B). There were 58 males and 54 females. The angle A, H1, T, L1, H2, L2 and L3 were bilaterally measured using plain X-rays and reconstruction CT. All measurements were taken at the thinnest part of the lamina in the axial and coronal plane.

### **Results**

The data of males were significant higher than those of female ( $P < 0.05$ ) except angle A according to our anatomic and radiographic measurement. There was no significant difference in the data of bilateral lamina ( $P > 0.05$ ). The data of group B have no significant statistic difference with those of group A. The thickness in 45 percent specimens is less than 6mm. The length of lamina in all specimens is less than 2.5cm, while length from entry point to rim of lamina is more than 3cm only in 5 percent specimens. The length from entry point to the lateral rim of lateral mass range from 2.5~4cm, however only 5% percent is longer than 4cm.

### **Conclusion**

The preoperative radiographic evaluation is very important to determine the suitable size of screws. The diameter of screws is mainly restricted by the thickness of C2 lamina. It is safe to use 2.5cm~3.0cm long screws in Chinese people. The radiographic measurement method we used is simple, accurate and reliable for preoperative measurement.

### **Key words**

C2 lamina, Radiographic measurement, Anatomic measurement

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**Point of abstract**

We reported a method for CT measurement of C2 lamina, and compared with data of anatomic measurement. Our method is simple and accurate. The thickness is <6mm in 45%. Length from entry point to lamina rim is >3cm in 5%. The lamina screws are restricted by lamina thickness and Length from entry point to lamina rim in Chinese population.

## **THE STAGES OF GROWING SKULL FRACTURE AND TREATMENT STRATEGY: REPORT OF 27 TREATED GSFS**

Liu Xue-song, MD

### **Background**

Growing skull fracture is a rare, but an important late complication of skull fractures, usually occurring during infancy and early childhood. Delayed diagnosis and improper treatment could exacerbate this disease.

### **Objective**

To introduce a new hypothesis, describe the stages of GSF, and discuss the treatment strategy.

### **Method**

We performed a retrospective review of 27 GSF patients, who were divided into three different stages. Six patients were in stage one, the pre-phase of GSF, 10 patients were in stage two, the early-phase of GSF and 11 were in stage three, the late-phase of GSF. All of the patients underwent duraplasty. Six patients in stage one and five patients in stage two underwent craniotomy without cranioplasty. Five patients in stage two and all of the patients in stage three underwent cranioplasty, with autologous bone and alloplastic materials, respectively. Five of all the patients underwent ventriculo-peritoneal shunt.

### **Result**

Over a period of 20 years, 27 GSF were treated in our department, including 16 males and 11 females. The mean follow-up period was 26.5 months. The symptoms of all the patients in stage one and two were alleviated or disappeared, and the cranial bones developed without deformity during the follow-up time. In the study of stage three, no obvious improvement in neurological deficits was observed. Due to cranial deformation or infection, three patients underwent additional operation.

### **Conclusion**

Identifying the stage of GSF according to our new hypothesis, accurately diagnosing and treating GSF during stage one and two leads to a better prognosis.

### **Key words**

Growing skull fracture, Treatment, Stage

The growing skull fracture is a rare but important complication of pediatric head trauma, occurring almost exclusively in children who are less than three years of age<sup>1-3</sup>. The GSF usually develops from the linear skull fracture, sometimes as in a minor closed-head injury. Therefore, the GSF is often misdiagnosed or the treatment is either wrong or delayed. During the last three decades, several cases have provided many theories of the GSF pathogenesis. However, the controversy about diagnoses methods and treatment strategy always exist.

## THE INCIDENCE OF BONE FLAP INFECTION IN A NEUROSURGICAL UNIT.

### Objectives

Postoperative infection after cranial surgery is a serious complication that often requires removal of the bone flap (1). Such infections occur in up to one third of postoperative craniotomies (2), with osteomyelitis in 3%-5% of patients (3). This study aimed to clarify the incidence of bone flap infection after cranial surgery in relation to recognised risk factors.

### Methods

A retrospective patient note analysis was conducted for infections requiring bone flap removal between November 2005 and November 2007. Information collected included original diagnosis, emergency versus elective ( +/- implants ) procedures, type and duration of original operation, closure methods, antibiotic use and recognised risk factors. All information was collected onto a proforma and a database created to extrapolate data.

### Results

70 patients had removal of bone flap / cranioplasty, with 45 confirmed bone flap infections ( 27 male, 18 female ). The average age was 50.5 years ( range 23-78 ). Indications for the original operation were space-occupying lesion 59%, vascular 17%, trauma 17%, and epilepsy ( IPG, lobectomy ) 7%, with an average duration of 4 hours ( range 2-7 ). The time from original operation to bone flap removal ranged from 8 days to 13 years with a mean of 448 days. Treatment for bone flap infection was removal only ( 20 patients ), removal and antibiotics ( 13 patients ), with no detailed operative data for 12 patients. In the period audited the bone flap infection rate was 0.9%, and the principal risk factor was steroid use ( 26 patients ).

### Conclusion

Our bone flap infection incidence rate is lower than other series, although does confirm known risk factors. The unit follows strict SSI guidelines, but has not yet managed to eradicate the condition. Very late presentation still occurs, and perhaps all cranial surgery contains the seeds of latent infection, a result of the original pathology and its treatment. A future prospective study examining higher risk patients is planned.

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## **OPERATIVE TREATMENT OF FRONTOBASAL INJURY COMBINED WITH CSF LEAK IN THE DEPARTMENT OF NEUROSURGERY ČESKÉ BUDĚJOVICE IN 2006-2009.**

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### **Introduction**

Anterior skull base fractures are followed by CSF leak in 10-30%. The reason is firm dural adhesion to the anterior skull base. Cumulative risk of meningitis within 10 years is reduced after successful surgery from 85 to 7%. The aim of our study was to evaluate the result of surgical treatment of frontobasal injury combined with CSF leak.

### **Method**

There were operated 33 patients in the department of Neurosurgery České Budejovice period 2006-2009 for anterior skull base fracture with CSF leak.

88 percent were men, mean age was 38 years, average f-u was 22 months. The main causes of injury were traffic accidents. 84% of patients had initial GCS 13-15 grade, in 8% was GCS 9-12 and last 8% were unconscious (GCS  $\leq$  8 grade). Anterior skull base fracture was often associated with other intracranial injury (brain contusion, epidural or subdural hematoma, cranial nerves lesion) and fractures of facial bones. Meningitis or brain abscess developed in 16% of cases before operative treatment.

Diagnosis was based on clinical signs and CT, in obscure cases beta 2 transferin was detected in the secret from the nose or was performed the examination with radionuclide.

The surgical procedure consists of extradural and intradural revision from bifrontal craniotomy with cranialization of frontal sinus. The suture of dura was performed and vascularized periosteal flap was laid extradurally. We didn't use perioperative CSF derivation.

Timing of the operation was on the average 15 days after injury. The reason of delay of surgery was brain edema in most cases.

### **Results**

Surgical exploration with extradural and intradural revision with suture of dura and periosteal flap technique was successful in our study in 88%. In 8% there was performed endoscopic revision of sphenoid cavity for persistent CSF leak. Revision intracranial operation was necessary in other 4% of patients. Fatal meningitis developed once after the operation (4%).

### **Summary**

The operative treatment of anterior skull base fracture with CSF leak significantly reduces the risk of developing meningitis. Complementing endoscopic endonasal approach was needed if dural injury in sphenoid bone cavity was present.

## **FEASIBILITY AND EFFECTIVENESS OF ENDOSCOPIC SURGERY FOR THIRD VENTRICULAR COLLOID CYSTS WITHOUT HYDROCEPHALUS**

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### **Purpose**

The intent of this study was to draw attention to the feasibility and effectiveness of endoscopic neurosurgery for a unique group of patients, those with a third ventricular colloid cyst but without ventriculomegaly.

### **Methods**

Twenty-two patients who underwent endoscopic management for a third ventricular colloid cyst were identified from a prospective database. Of these patients, 6 had not concomitant hydrocephalus and underwent primary endoscopic surgery for resection. The surgical technique, the success rate, and patient outcome were assessed and then compared with 16 hydrocephalic patients who underwent similar procedures.

### **Results**

The ventricular compartment was cannulated successfully and the intended goal was accomplished in all patients (100%). There were no operative complications related to the endoscopic procedure, and no patient required subsequent intervention for hydrocephalus. The results in this group of patients did not differ with the success and morbidity after endoscopic tumor surgery in patients with hydrocephalus.

### **Conclusion**

Endoscopic resection of third ventricular colloid cyst in patients without hydrocephalus is feasible, effective and not contraindicated. The described procedure uniformly satisfied the intended surgical goal.

## **ASSOCIATION BETWEEN HYPOTHALAMIC HAMARTOMAS, PRECOCIOUS PUBERTY, AND GELASTIC SEIZURE: REPORT OF THREE CASES**

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Gelastic epilepsy (GE) associated with hypothalamic hamartomas (HHs) is now a well-characterized clinical syndrome consisting of gelastic seizures starting in infancy, medically refractory seizures with or without the development of multiple seizure types, and behavioral and cognitive decline. Association between precocious puberty and HH is known also.

It has been postulated that the development of the HH-GE syndrome is a result of a progressive epileptic encephalopathy or secondary epileptogenesis, which is potentially reversible with treatment of the HH. A variety of surgical options for the treatment of HHs exist, including open and endoscopic procedures, and radiosurgery.

We reports three cases of different combination of mentioned pathologies. One case of precocious puberty and HH without GE, one case of gelastic seizure in association of HH, and one case of precocious puberty, gelastic seizure, and HH.

Surgical treatment can result in seizure freedom in up to 50% of patients and can be accompanied by significant improvements in behavior, cognition, and quality of life. Partial treatment of HHs with gonadotropin agonists may be sufficient to reverse precocious puberty and improve behavior and quality of life with less risk. A component of reversible cognitive dysfunction may be present in some patients with an HH-GE syndrome.

## **UNREMARKABLE UPPER CERVICAL TRAUMA CAUSING CSF FISTULA AND SEVERE RELUCTANT HEADACHE DUE TO INTRACRANIAL HYPOTENSION**

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### **Introduction**

Chronic Intracranial hypotension is a rare neurological entity and despite its acute counterpart (following spinal tap) is very difficult to treat. Diagnosis need high index of suspicion and finding the culprit pathology would be a demanding radiological task.

### **Materials and methods**

A 25-year-old medical student presented with a two-week history of severe headaches starting during her excursion at seaside. Headaches started from the night following hours of jet skiing and were irresponsive to available medication. Only recumbency and coffee relatively ameliorated her condition. No other finding was noteworthy in her recent and previous medical history. MRI showed dural enhancement and cerebellar sagging which are pathognomonic of disease. Full spine CT myelogram showed typical posterior C1-C2 dural fistula.

### **Results**

We intended to treat her non-surgically. The first epidural blood patching was tried with 20 mL blood and within a week a second trial with 40 mL of peripheral blood proved to be successful.

## **ENDOSCOPIC ENDONASAL PITUITARY SURGERY: PRACTICAL KEY POINTS WHICH WE HAVE LEARNT THROUGH OUR LEARNING CURVE (4 YEARS EXPERIENCE)**

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### **Background**

Conventional transsphenoidal pituitary surgery is increasingly replaced by endoscopic endonasal approach. After 3 years of conventional TSS, We began to practice endoscopic pituitary surgery. In the first year we tried mixed approach and then used pure endoscopic endonasal approach for the last three years. Have a look on how we have been passing the procedure's learning curve, it revealed to us so many important hints we found them worth mentioning.

### **Methods**

We reviewed the data sheets and movies of our first 30 (total 110 patients) endoscopic endonasal transsphenoidal pituitary surgeries. Details of various parts of approach with pre and post operative images and follow up data reviewed and modifications in each part according to later cases were noticed.

### **Results**

With more practice, the size of dural opening, the ability to addressing suprasellar or lateral extensions and at last the ability to do an extracapsular dissection increased while risk of post-operative DI and intraoperative CSF leak decreased. However the rate of complications does not change. Practical key points to achieve these results along with technical improvements were discussed. Key principles and critical equipment used in the procedure with anatomical and surgical hints have been emphasized.

### **Conclusions**

Beside scientific knowledge that should be obtained in field of anatomy, another need is the ability to work and use endoscope in a teamwork manner which is the most basic difference from microsurgery. So, there is a learning curve and beginner's pitfalls could be of tremendous help for the others to cope with the new setting.

## **EXPRESSION OF MATRIX METALLOPROTEINASE 2 AND 9 IN CRANIOPHARYNGIOMA AND THEIR ASSOCIATIONS WITH RECURRENCE**

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This work was supported by the Doctoral Fund of Ministry of Education of China (No.20080441210) and National Nature Science Found of China (30872646).

### **Objective**

Matrix metalloproteinase 2 (MMP-2) and 9 (MMP-9) play an important role in the invasion and metastasis of tumor. A reported case found urinary MMPs associated with tumor recurrence. The aim of the paper is to investigate the expressions of MMP-2 and MMP-9 in craniopharyngioma and their relationship with tumor recurrence in a large series.

### **Methods**

Forty cases adamantinomatous craniopharyngioma(ACP), 40 cases squamous papillary craniopharyngioma (SCP) and 5 normal cerebral tissues were stained with immunohistochemical method in this study, and the expressions of MMP-2 and MMP-9 were detected with high definition colorful medical graph analysis system, the recurrence of tumor and recurrence free survival of patients also reviewed, and the results were then performed with statistical analysis.

### **Results**

The overall expression rates of MMP-2 and MMP-9 in craniopharyngioma were extremely high, reaching 91.7% and 93.3%, respectively, and the expression of MMP-9 was higher than MMP-2 in all groups. And the expression of MMP-9 were higher than that of MMP-2 in every pair of craniopharyngioma groups (ACP vs SCP, recurrence group vs primary group, primary group vs control group,  $p < 0.05$ ). MMP-9 and MMP-2 expressions were positively linear correlated in every group. Meanwhile, MMP-9 was also expressed in tumor vascular endothelial cells, especially in the solid SCP.

### **Conclusion**

MMP-2 and -9 were extensively expressed in craniopharyngioma cells, and their overexpression, specially MMP-9, were probably involving the infiltration and recurrence of the tumors. MMP-9 was also extensively expressed in vascular endothelial cells, which was likely to take part in the angiogenesis of

craniopharyngioma. An obvious positive linear correlation exists between MMP-9 and MMP-2. The simultaneous high expressions of the two molecules in a patient were mostly associated with the invasiveness and the long term risk of recurrence.

**Key words**

Craniopharyngioma • MMP-2 • MMP-9 • Invasion • Recurrence

## **ANTERIOR CERVICAL DISC SURGERIES**

Dr.Hariprakash and Dr.M.Balamurugan

### **Abstract**

Implants and prosthesis has led to evolution in anterior disc surgeries from conventional anterior cervical fusion procedures to placement of artificial spacers to motion preservation surgery like cervical arthroplasty. Motion segment analyses in cervical arthroplasties have reported a motion preservation of around 5 degrees. The positive impact of motion preservation surgery on the activities of daily living has been studied in the western population. The applicability of these results in context to a emerging economy like India, is studied.

### **Objective**

To compare impact of anterior cervical fusion with bone grafts, spacer placement and cervical arthroplasty, on activities of daily living in Indian subjects and the implications of the cost of treatment in these three groups.

### **Materials and methods**

Its retrospective case control study of 240 patients who underwent different surgeries for cervical disc disease during the period of January 2005 till January 2009. We compared the activity of daily living using an innovative scale devised for the study population. The cost of the different procedures was compared. The Minimum follow up period was 1 year.

### **Results**

126 patients anterior cervical discectomy and bony fusion (ACDF), 39 patients under cervical arthroplasty, 75 patients underwent anterior cervical discectomy and spacer placement. At the follow up period of 1 year we did not find any significant difference in the activity of daily living among these three groups. The patients who underwent spacer placement and the patients who underwent arthroplasty had a quicker post operative recovery when compared to ACDF group. The cost surgeries remained significantly different, with average cost per surgery for ACDF being 60000/-Rs, placement of spacer being 70000/- Rs and cervical arthroplasty being 120000/-Rs.

### **Conclusion**

The use of implants in an emerging economy like India remains a difficult decision, keeping in mind the different level of activities which in part depends on the socioeconomic strata the patient belongs to. In our opinion the possible clinical benefits due to different surgical procedures could have been masked due to a relative small cohort.

**Rare Distal Non-infectious Shunt Complication**

Dr. M.Balamurugan, Dr. Hariprakash and Dr. Sumana P.

**Abstract**

We had three interesting distal ventriculoperitoneal shunt complication. One was a 2 year child boy who presented with primary aqueductal stenosis for whom VP shunt was done and on the 7th postoperative day he developed a large aseptic ascitis.

The Second was a 45 year old lady who underwent shunt surgery primarily shunt surgery for post-meningitic hydrocephalus. Following that she developed shunt dysfunction after 2 years and during shunt revision we found a fibrotic membrane encasing the abdominal end.

The third was a 40 year old gentleman who had underwent VP shunt surgery for post traumatic hydrocephalus, developed loculated non-infectious ascitis 10 years later.

The mechanisms of distal shunt failures and the pathophysiology will be discussed.

## **AWAKE TRANSCEREBELLAR STEREOTACTIC BIOPSY FOR CEREBELLAR AND BRAINSTEM LESIONS IN CHILDREN**

Dr. M.Balamurugan, Dr. Purav P, Dr. Hariprakash, Dr. Sumana P.

### **Abstract**

Brainstem and cerebellar lesions are pathologically heterogenous. Pre-operative radiological diagnosis prove to be wrong in about 20% of cases. It is therefore imperative to have a tissue diagnosis for appropriate therapeutic measures.

We report a series of 30 patients, who underwent CT guided stereotactic biopsy for cerebellar and brainstem lesions.

All cases were done under mild sedation and in an awake state with local anaesthetic supplements. The trajectory was by the sub-occipital transcerebellar route in a semi-sitting position.

The inclusion and exclusion criteria for the procedure will be discussed.

Histological diagnosis was established in 29 patients with no procedure related morbidity or mortality.

Awake stereotactic biopsy via the transcerebellar route is a safe, reliable and effective method to biopsy the lesions in this difficult area of the brain.

## ARCHITECTURAL ANATOMY OF WHITE MATTER PATHWAYS

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### Introduction

A detailed knowledge of three-dimensional anatomy of the white matter fibers is paramount for neurosurgeons dealing with intrinsic brain lesions. Neurosurgical approaches to different compartments of the brain cannot be performed without an in depth understanding of the anatomical subsystems of the white fibers, which is propedeutic to their radiological (DTI-MR) and functional understanding.

### Materials and methods

Thirty previously frozen, formalin-fixed, human brains (60 hemispheres) were dissected from the lateral surface to the medial surface in a stepwise fashion, under the operating microscope, using the Klingler's fiber dissection technique. The brains were obtained from fresh autopsy specimens (maximum of 12 h after death) and were fixed in a 10% formalin solution for at least two months. The basilar artery was ligated and used to suspend each brain in the formalin solution, so that the brain would maintain its normal contours. After two months, the pia mater, arachnoid membrane, and vessels of the specimens were carefully removed, using the operating microscope. The brains were washed under running water for several hours to remove the formalin, drained, and refrigerated for 1 week at a temperature of -10° to -15°C. When the specimens are frozen, formalin ice crystals form between the nerve fibers, expanding and separating them. The freezing process facilitates the dissection of fine fiber bundles in particular. Fiber dissection was performed with self-made wooden spatulas or gentle suction under the microscope.

### Results

In all specimens the "U" fibers, the superior longitudinal and arcuate fasciculus, the extreme and external capsule, the inferior fronto-occipital fasciculus and uncinate fasciculus, the optic radiations, the corona radiata and internal capsule, the corpus callosum and anterior commissure, the cingulum and fornix were identified. In

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particular the three-dimensional relationships between different white matter pathways were described.

### **Conclusions**

The complex architectural anatomy of the brain can be more clearly defined and understood as the fiber dissection technique is used. This knowledge can be incorporated into the preoperative planning process and applied to surgical strategies. Fiber dissection greatly adds to our knowledge of brain anatomical features and thus helps to improve neurosurgical strategies for intrinsic brain tumors and vascular malformations. Therefore, we highly recommend to include the Klingler's method in the neurosurgical training.

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## **CASE REPORT: LEFT FRONTAL MAV REMOVAL FOLLOWED BY SUPPLEMENTARY MOTOR AREA SYNDROME**

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A woman of 32 years comes to the emergency room of a suburban hospital after a generalized seizure and vomiting. Thanks to a brain CT performed in emergency, interpreted as positive for the left frontal cerebral hematoma, the patient is sent at the DEA's Policlinico Umberto I - Rome, where the neuroradiologist raises the suspicion of MAV. The patient, neurologically asymptomatic, performs a brain MRI and angioMRI with Gd, which confirms the presence of a left mesial frontal AVM, with signs of recent bleeding, 4.0x2.5x3.5 cm in size. Is performed a cerebral angiography, which shows the afferent artery against hypertrophic vessels from the left anterior cerebral artery and a perforating artery from the distal ipsilateral M1 stretch. The venous drainage is superficial. Functional MRI performed with a motor task (finger tapping) shows an area of activation near the lesion, so the MAV is assigned a grade III according to Spetzler-Martin. Once found impossible to treat by the interventional radiologist, a neurosurgical procedure and microsurgical technique with the aid of neurophysiological monitoring was planned. The lesion was removed completely, as demonstrated by intraoperative angiography and a control angiography after 1 month, showing the restoration of a physiological cerebral hemodynamics. With regard to postoperative clinical conditions, between the first and seventh day after surgery the patient experiences a silence, accompanied by a vague and transient attention deficit and prussic involving in particular the right of Emilia. Subsequently, there has been a steady recovery of the phasic function, up to a near normal condition that occurs to the control at 1 month.

This set of symptoms appears to adhere to the supplementary motor area syndrome. This is a rare neurological syndrome in neurosurgical observation and description for MAV mesial frontal lobe dominance. *This clinical event, whose main characteristic is the massive amount of the reversibility of symptoms, should be properly framed in the context of the assessment areas "eloquent" when you run the preoperative evaluation and grading for a patient with AVM of the fronto-mesial dominant lobe.* The recognition of this syndrome can provide a more accurate patient information, and in order to minimize the occurrence of anxiety in the postoperative period.

## **INTERBODY FUSION USAGE AFTER DISCECTOMY IN THE THORACIC SPINE.**

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### **Purpose**

To analyze the result of interbody fusion and risk of development instability after discectomy in thoracic spine.

### **Methods**

It was found that after removal of the disc herniation the procedure was associated with an high rate of instability. The focus of this paper is the interbody fusion using after discectomy. We retrospectively reviewed the cases of 16 consecutive patients presenting with herniated thoracic discs in whom surgery was performed and interbody fusion was used. The median patient age was 47 years (range 25–79 years); there were 10 men and 6 women. Fourteen patients had myelopathy and two radiculopathy. Precipitating events were identified in 13 patients and included falls (three cases), sports-related activity (three cases), heavy lifting (three cases), twisting motion (one case). Neuroimaging studies included computerized tomography myelography in four patients, magnetic resonance imaging in 10, or both in eight.

### **Results**

In the immediate postoperative period, a decrease or disappearance of pain were observed in 12 patients, reduction of motor conduction disorders in 15 patients, improving the sensitivity of conductors in 16 patients, improvement of the pelvic organs function in 4 patients, the reduction of segmental and radicular disorders in 10 patients. 8 patients could walk without assistance in the immediate postoperative period. No patient suffered postoperative spinal instability–related pain or delayed kyphosis

### **Conclusions**

Application of interbody fusion in thoracic spine allows improving results of operative interventions at patients with degenerative disc disease. Application of interbody fusion prevented destabilization of the spine after discectomy in thoracic spine during the use of accesses, with various degree of bone structures resection.