Journal für
Neurologie, Neurochirurgie und Psychiatrie

www.kup.at/
JNeurolNeurochirPsychiatr

Zeitschrift für Erkrankungen des Nervensystems

5th Meeting of the Central European Neurosurgical Society - Vienna, September 18-20, 2008 - Abstracts

Journal für Neurologie Neurochirurgie und Psychiatrie

2008; 9 (Sonderheft 1), 4-33

Indexed in
EMBASE/Excerpta Medica/BIOBASE/SCOPUS

Krause & Pachernegg GmbH • Verlag für Medizin und Wirtschaft • A-3003 Gablitz

P.b.b. 02Z031117M, Verlagsort: 3003 Gablitz, Linzerstraße 177A/21 Preis: EUR 10,–

76. Jahrestagung
Deutsche Gesellschaft für Neurochirurgie
DGNC
Joint Meeting mit der Französischen Gesellschaft für Neurochirurgie
© Westend61; naka – stock.adobe.com
2025
1.–4. Juni
HANNOVER
www.dgnc-kongress.de
Im Spannungsfeld zwischen Forschung und Patientenversorgung
PROGRAMM JETZT ONLINE EINSEHEN!

Deutsche Gesellschaft für Epileptologie
64. JAHRESTAGUNG
der Deutschen Gesellschaft für Epileptologie
10.–13. Juni 2026
Würzburg
© CTW Dietmar Denger/Kooto/KARL70

5th Meeting of the Central European Neurosurgical Society Vienna, September 18–20, 2008

Speakers' Abstracts

Session I: Strategies in Meningiomas

O-01

Meningiomas of Cerebellopontine Angle With Internal Auditory Canal Extension

E. Zverina[1], M. Chovanec[1], J. Betka[1], J. Kluh[1], T. Šmilauer[1], J. Kraus[2]
[1]Dept. of Otorhinolaryngology and Head and Neck Surgery, 1st Faculty of Medicine; [2]Dept. of Pediatric Neurology, 2nd Medical Faculty, Faculty Hospital Motol, Charles University Prague, Czech Republic

Introduction Meningiomas after vestibular schwannomas represent the second-most frequent common tumor type of the cerebellopontine angle (CPA). Meningiomas growing into the internal auditory canal (IAC) are extremely rare with only small series reported. We present our microsurgical experience with the aim of radical removal and cranial nerve function preservation.

Methods From the patient sample retrospectively analyzed, 14 patients with meningiomas of CPA with IAC extension underwent surgery between 1999 and 2007. All patients were examined by electrophysiological (audiometry, neurotology, EMG) and imaging methods (CT, MRI). The majority of tumors were large compressing brainstem tumors confined to the posterior fossa, and 1 tumor was extending extradurally to the jugular foramen and neck. The majority of cases were sporadic, in 1 case both vestibular schwannoma and meningioma were encountered and in 1 case NF2 was diagnosed. Intra-operative monitoring was mandatory. Most cases were operated by retrosigmoid approach, and 1 case with presigmoidal and neck extension. To achieve radical removal of the tumor opening of the IAC was needed.

Results Extent of tumor resection was Simpson grade I or II in most cases. Follow-up including imaging ranges from 1–8 years. There was no mortality. 1 revision surgery had to be performed due to supratentorial subdural hematoma. Only 1 tumor recurrence in the IAC with small CPA extension was diagnosed. This case was treated using the Leksell gamma knife for misdiagnosis of vestibular schwannoma. Postoperative transitory n.VII dysfunction (HB III) in 2 cases, 1 permanent and 1 transitory n.V dysfunction, 1 transitory and 1 permanent n.IX and n.X dysfunction were encountered. In 5 cases, preservation of hearing was achieved. In 3 of these cases, hearing improvement with an exceptional improvement from deafness occurred.

Conclusion Microsurgical treatment with wide opening of IAC and intra-operative monitoring enables radical removal of majority of CPA meningiomas with IAC extension. Preservation of cranial nerve function is possible even with improvement of hearing. The majority of tumors at the time of diagnosis are large and therefore not suitable for steroradiosurgical treatment. Further histological diagnosis is confirmed thus distinguishing meningiomas from vestibular schwannomas which is not always possible with imaging only.

O-02

Meningiomas Involving the Optical Nerve – Is There Still Place for Surgical Therapy?

M. Vaverka, J. Macháč, D. Krahulík, L. Hrabálek
FNO Olomouc, Czech Republic

Introduction As the safety and efficacy of stereotactic radiosurgery have been widely approved in the treatment of complex cranial base lesions, an increasing number of meningiomas have been treated with this modern technology. Meningiomas involving the optic nerve, however, primary tumors of the optic nerve sheath or secondary extended tumors from cavernous sinus, planum sphenoideale, tuberculum or diaphragma sellae and spheno-orbital localization, can be considered as a special group.

Methods In a group of 185 intracranial meningiomas surgically treated within the last four years, data of 33 patients with meningiomas involving optic nerves were reviewed using operative notes, pre-, intra- and postoperative imaging and ophthalmological examination findings. In all patients, preoperative CT and MR imaging was performed.

Results and Discussion Authors find the optic nerve involved in a surprisingly high number of patients and the degree of involvement ranges from a truly encased nerve to the tiny surface of the tumor, which cannot be identified in MR imaging. Fragility and vulnerability of the optic nerve are based on the disturbances of vessels supplying the nerve, which tolerates only minimal surgical manipulation. Intact arachnoid membrane in the intradural portion of the nerve and extradural unroofing bone optic canal and fissura orbitalis superior according to Dolenc with an opening optic nerve sheath at the beginning of procedure permitted the authors to safely identify the nerve and to complete the dissection of the tumor from the nerve in all cases. In cases with large tumors, the procedure was continuing in the conventional microsurgical technique with the splitting of Sylvian fissure.

The limited factor for outcome are preoperative visual changes – patients with preoperatively minimally compromised vision had better results. It means that treatment can be indicated as soon as possible, especially in cases with blindness in the opposite site.

The difference between approximately 8 Gy, tolerated by the normal optic nerve, and the radiosurgically marginal dose around 14 Gy for tumor control is still under discussion. Sequential usage of both methods – microsurgery and radiosurgery – in staged procedures in various patients is part of the paradigm shift nowadays.

Conclusion Meningiomas that involve optic nerves require special consideration and surgical techniques. The tumor could be completely resected from the optic nerve in most cases. Extradural unroofing of the bony optic canal is crucial for many reasons:

Additionally, extradural decompression allows the surgeon to interrupt a substantial portion of the tumor blood supply and anterior clinoidectomy also adds more surgical space for manipulation. In cases involving large tumors, locating and identifying the optic nerve is fa-

cilitated in normal areas and when following into the tumor. When the tumor recurs or regrows, the optic nerve has room to be displaced, without compromising vision. In cases requiring postoperative radiotherapy, an optic nerve free of disease is spared the deleterious effects of radiotherapy and the tumor can safely receive the radiation dose required for tumor control.

Histological examination of the tumor also brings important information, if radiosurgery is needed in staging procedures in high-grade meningiomas in the early postoperative period.

O-03

Two-Stage Surgical Treatment of Huge Benign Meningiomas

J. Andrychowski, K. Budohoski, Z. Czernicki, S. Szlufik, B. Urbański, P. Jasielski
Department of Neurosurgery Polish Academy of Sciences, Medical University, Warsaw, Poland

Introduction Surgical treatment of huge, benign intracranial tumors frequently causes trouble. The result depends on our ability to reach a compromise in how radical a surgery can be, derived from neuroanatomic relations. Problems are linked to surgery duration and to an extended exposure to anesthetic agents. Extension of time influences the possibility to correct hematologic, hemostatic, hemodynamic disorders, it influences also immunoparalysis and the organism's catabolism.

Aim Assessment of intra-operative parameters which have decisive influence on the patient's clinical condition after surgery.

Material and Methods During the last 5 years, we performed surgical treatment on 16 patients with particularly huge tumors. 11 patients having supratentorial meningioma with a diameter > 60 mm, 5 patients with infratentorial tumors in the cerebellopontine angle and cerebellum hemisphere – 5 cases with a diameter > 45 mm. All tumors were treated with microsurgery techniques, CUSA and microscope. Preoperative embolisation was not performed. Between the first and the second stages of surgery, a patient was observed and CT and MRI examinations were performed after 2–4 months, patients were submitted to the second stage of surgical treatment. The decision to finish the first stage was taken *ad hoc* and collectively with the neuroanesthesiologic team. An *ad hoc* decision was initiated when increasing symptoms of hemostatic and hemodynamic disorders occurred.

Results The teams tried to finish surgery without exceeding blood transfusion of 900–1200 ml ME with the hematocrit value of approximately 30 % (3–4 units of PBRC & Hct ~30 %). In cases of infratentorial tumors, surgery time was influenced by the close relationship with the brain stem and nerves, and the decision to finish the first stage resulted also from the observed tendency of the cerebellar hemisphere to swelling. In 4 cases of supratentorial tumors the bone flap was removed after the first operation, in retrosigmoidal approach in 4 cases after the craniotomy flap was removed due to cerebellar edema. In the second stage, the tumors were removed and the bone was restored.

Conclusions The application of the two-stage surgical procedure allowed for an optimal postoperative course. From the neurosurgical point of view, during the second stage of surgical treatment, an easy removal of the tumor and its separation from the anatomic adjacent structures were made clear and simple. The second stage of surgical treatment is, in general, much shorter than initially planned, and it lasted approximately four hours on average. In the postoperative course, after the first and the second stages, no significant disturbances were observed. The time of intensive therapy and hospitalization were reduced. The effect of tumor removal was assessed in MRI.

O-04

Fluorescent In-Situ Hybridization and Ex-Vivo ^{1}H MR Spectroscopic Examinations of Meningioma Tumor Tissue

W. Pfisterer
Neurosurgical Department, Sozialmedizinisches Zentrum-Ost, Donauspital, Vienna, Austria

Introduction We analyzed the frequency and distribution (regional heterogeneity) of genetic abnormalities and the biochemical findings in a series of 158 meningiomas, to evaluate the correlation to the clinical outcome of patients.

Methods Paraffin-embedded tumor tissue samples were used for fluorescent in-situ hybridization (FISH) to examine aberrations of chromosomes 1p, 14q, and 22q. Snap-frozen samples were examined with proton magnetic resonance spectroscopy (1H MRS) to identify concentrations of key metabolites in the tissue ex vivo. Clinical and pathological parameters were retrospectively reviewed in the patients as part of routine clinical management. These data were evaluated for potential unique associations with diagnostic significance.

Results Chromosomal aberrations were detected in nearly 50 % of grade-I, in 93 % of grade-II and in 100 % of grade-III meningiomas. The numbers of chromosomal aberrations correlated significantly to MIB-1 ($p < 0.001$), with signs of grossly invasive tumor growth ($p < 0.001$), and with tumor recurrence ($p < 0.01$).

The choline-to-glutamate ratio correlated with the histopathological subtype ($p < 0.05$). The glutamine-to-glutamate ratio and the ratio of glycine to total glutamine and glutamate correlated with the recurrence ($p < 0.05$) using the resection grade as a covariate. Alanine was decreased in meningiomas with chromosomal aberrations. The absolute concentration of total creatine was significantly decreased in high-grade meningiomas compared to low-grade meningiomas as was the ratio of glycine to alanine ($p < 0.05$). Additionally, the glycine-to-alanine ratio was able to distinguish between primary and recurrent meningiomas according to logistic regression. Finally, both the absolute concentration of creatine and the glycine-to-alanine ratio were able to predict rapid recurrence ($p < 0.001$ and $p < 0.05$, respectively).

Conclusion Distinct molecular genetic and biochemical alterations differentiated clinically aggressive from clinically benign meningiomas that are not typically identified by histopathology alone. Patients with chromosomal aberrations demonstrated a higher rate and a shorter time to recurrence. Creatine, glycine, and alanine may be employed as markers of meningioma grade, recurrence, and likelihood of rapid recurrence.

O-05

Review of Stereotactic Radiosurgery for Meningiomas. Comparison of the Results of LINAC, Stereotactic Brachytherapy and Gamma Knife Radiosurgery of Meningiomas

M. Sramka[1], A. Viola[2,3], T. Major[4], Z. Kolonban[3], J. Julow[3]
[1]St. Elisabeth University of Health and Social Sciences and St. Elizabeth Oncological Institute, Department of Stereotactic Radiosurgery, Bratislava, Slovakia; [2]Semmelweis University Doctoral School, Budapest, Hungary; [3]St. John's Hospital, Department of Neurosurgery, Budapest, Hungary; [4]National Institute of Oncology, Department of Radiotherapy, Budapest, Hungary

Introduction The present study discusses the results of the Iodine-125 brachytherapy of seven meningiomas, performed between September 2000 and September 2007. One of the irradiated meningiomas was residual, six were recurrent and four malignant.

Method Image fusion was used at the planning of interstitial irradiation, as well as at the evaluation of control CT and MRI examinations following operation. Image fusion and the planning of irradiation were carried out using the Target 1.19 irradiation planning software (BrainLab). Following irradiation, the median follow-up of our

four living patients was 21 months (13–37 months). Their tumors shrank a median of 54 % (32–100 %). Following brachytherapy, median tumor shrinkage was 52 % (2–100 %) for all meningiomas.

Results After reviewing the data of 16 studies published between 1990 and 2008 on interstitial irradiation, LINAC and Gamma knife radiosurgery of meningiomas, it was apparent from the rate of shrunken meningiomas and meningiomas showing no volumetric change, that tumor shrinkage was more frequent following brachytherapy (89.2 %). Shrinkage of meningiomas following Gamma knife and LINAC radiosurgeries accounted for 59 and 48.5 %, respectively.

Conclusions We recommend Iodine-125 interstitial irradiation for the treatment of meningiomas which are recurrent, multiple malignant, occurring at an elderly age, located in the skull base or those being at high risk for microsurgical removal.

O-06

Vestibular Schwannomas: Variations in Surgical Technique According to Tumor Size

M. Tatagiba, G. C. Feigl
Department for Neurosurgery, University Hospital Tübingen, Germany

Objective It has been shown that complete removal of vestibular schwannomas (VSs) with structural and functional preservation of the facial and cochlear nerves can be achieved. However, the microsurgical technique has to be adapted to the tumor size. It was the aim of this study to review our surgical results and to describe the variations in surgical technique according to tumor size.

Methods A total of 150 consecutive patients with VSs ranging in size from T1 to T4 who underwent microsurgical tumor removal were included in a retrospective analysis. All patients underwent thorough pre- and post-operative neurological as well as neuroradiological examinations and were followed up regularly. All surgeries were performed under continuous neurophysiological monitoring including motor-evoked potentials of the facial nerve.

Results Total tumor removal was achieved in 97 %. In patients with tumors ranging from T1 to T4, the rate of anatomical preservation of the facial nerve was 94 %. The achieved rate of preservation of functional hearing in patients with functional hearing before surgery was 50 %. All cases were operated via a lateral suboccipital approach. No mortalities were observed in this study.

Conclusion Results of this study show that by using a refined microsurgical technique and intra-operative monitoring, VSs of all sizes can be safely removed. Further proof is given to the fact that the lateral suboccipital approach allows resection of VSs of all sizes. However, the microsurgical technique has to be adapted to the tumor size in order to achieve a high percentage of functional preservation of facial and cochlear nerves.

Session II: Treatment of Cerebral Aneurysms

O-07

Endovascular Coiling of Ruptured Intracranial Aneurysms – Ten-Year Single-Centre Experience

V. Beneš[1, 2], M. Bradley[2], A. Molyneux[2], S. Renowden[2]
[1]Department of Neurosurgery, Regional Hospital Liberec, Czech Republic,
[2]Department of Neuroradiology, Frenchay Hospital Bristol, United Kingdom

Introductin The International Subarachnoid Aneurysm Trial (ISAT) demonstrated that the rate of death and dependency at one year after endovascular treatment of ruptured intracranial aneurysms is superior to surgical clipping (23.5 vs 30.9 %) and the advantage is maintained for at least seven years. Results from a single centre can also provide valuable information regarding the rates and outcomes of procedural complications and rebleeding. Comparing institutional long-term clinical outcome to ISAT can help monitor the center's safety and efficacy. Here we present ten years of experience from January 1996 to December 2005 at our institution.

Methods During the 10-year period, patient data, hemorrhage severity, aneurysm characteristics, procedural information including complications, immediate and long-term outcome were entered into a prospectively collected database and subsequently analyzed.

Results A total of 780 aneurysms were treated in 711 patients who presented with subarachnoid hemorrhage from a ruptured intracranial aneurysm over this period. Endovascular coiling was not successful in the treatment of 25 aneurysms (3 %), 20 patients underwent surgical clipping, 5 patients, all poor surgical candidates, were treated conservatively. Procedural ruptures occurred in 37 cases (4.7 %), 6 patients died, 1 became dependent, remaining ruptures were either asymptomatic or the patients made good recoveries. Thromboembolic complications occurred in 27 procedures (3.4 %), 4 patients died and one became dependent, remaining events were either asymptomatic or transient and the patients made good recoveries. One patient died after basilar artery rupture, 3 patients became dependent or died after accidental parent artery occlusion. Altogether, 9.3 % of procedures were complicated by the mentioned events. Rebleeding occurred in 16 patients (2.1 %) of which 12 died. At 6 months follow-up 130 patients (18.3 %) were dependent or dead, 580 (81.6 %) made excellent or good recovery, one patient was lost to clinical follow-up. Angiographic follow-up was available on 511 aneurysms, 121 (23.7 %) recanalised. Retreatment for recurrence was necessary in 51 aneurysms (7.1 %).

Conclusion At our institution overall procedural morbidity and mortality of endovascular treatment account for death or dependency in 2 % of patients. Approximately 5 % of aneurysms rupture during coiling and 3–4 % of procedures are complicated by a thromboembolic event, however most of these complications remain clinically silent. Rebleeding after therapy accounts for 1.7 % mortality. One quarter of aneurysms is likely to be recanalised on follow-up and 7 % will require retreatment. Long-term clinical outcome of aneurysmal subarachnoid hemorrhage patients treated by coil embolization at our institution compares favorably with the high standard set by the ISAT study.

O-09

Intracerebral Intratumorous Aneurysms – the Rationale of Interdisciplinary Treatment

B. R. Fischer[1], S. Palkovic[1], M. Holling[1], T. Niederstadt[2], A. Jeibmann[3], H. Wassmann[1]
[1]Department of Neurosurgery; [2]Institute of Clinical Radiology; [3]Institute of Neuropathology, University Hospital of Münster, Germany

Introduction Intracerebral aneurysms occur only in a few cases in combination with intracranial neoplasm and very rarely within a tumorous lesion. The co-existence is mostly found in pituitary tumors and meningioma. In this study, we review the literature and our own patient data for possible explanations for intracerebral intratumorous aneurysms, and present treatment strategies.

Methods We browsed our own database as well as published data from the National Library of Medicine Data for the keywords "aneurysm", "brain tumor", "intratumorous", taking into account various spellings. The publications were analyzed concerning patients' age, sex, tumor entity, cause of symptoms (tumor and/or aneurysm), treatment strategy (surgical and/or endovascular procedures) and outcome.

Results Data of 13 patients with intracranial intratumorous aneurysms were found. The coexisting pathologies were documented in 10 female and 3 male patients, with a mean age of 43.2 years (range: 7–72 years). In 4 patients, the tumor was a meningioma, in 3 a pituitary tumor was found, in 2 pilocytic astrocytoma and in 1 glioblastoma, epidermoid cyst, lipoma as well as a cystic lesion, each. Clinical symptoms in 6 patients were caused by tumor growth, whereas aneurysm growth or rupture was seen in 5 of them. In 2 patients, a differentiation between tumor and aneurysm growth as cause of the pathology was not possible. One patient died due to aneurysm rupture, before introduction of any therapeutic procedures. Another died after aneurysm rupture following radiation therapy of the tumor. In all other patients, a tumor as well as the aneurysm were

treated successfully. Whereas the tumor was more or less resected by surgery, the aneurysm was occluded either surgically (5 patients) or by endovascular treatment (5 patients). In one other patient, a combination of surgical and endovascular treatment was necessary. The neurological status remains stable in treated patients.

Conclusion Patients with combined intracranial pathology, i.e. tumor and aneurysm, should be diagnosed meticulously and without delay using modern neuroimaging techniques for exact and successful therapy planning. The appropriate approach to exclude an aneurysm (surgically or endovascular) should be introduced at first before starting any other therapy modalities.

0-10

Endovascular Management of Pediatric Intracranial Aneurysms

S. Řehák[1], A. Krajina[2], J. Náhlovský[1], P. Ryška[2]
[1]Department of Neurosurgery, University Faculty Hospital, Hradec Kralove;
[2]Department of Radiology, Faculty Hospital, Hradec Kralove, Czech Republic

Introducion Arterial aneurysms in children are clearly different from those diagnosed in adults. Despite their location at the bifurcation of various vessels, intrinsic hemodynamic factors almost certainly play less of a role than in adults. Mural or systemic factors are considered to be more important. The purpose of this paper is to discuss the radiological and clinical features of pediatric intracranial aneurysms including endovascular techniques currently being used for their therapy.

Methods Pediatric patients who presented with the diagnosis of intracranial aneurysm between January 1985 and December 2006 were included. The data were collected retrospectively. Clinical features included presentation, treatment and outcome. Radiological features included location, size and number of aneurysms present.

Results We present 11 patients ranging from 1 to 18 years of age who had intracranial aneurysms. Two patients (18 %) had giant aneurysms and another two (18 %) had multiple aneurysms. Endovascular treatment was performed in seven patients (64 %), neurosurgical treatment in three patients (27 %) and one patient died prior to any surgical or radiological intervention.

Conclusion Aneurysms in children, like those in adults, can and have been successfully treated utilizing endovascular as well as neurosurgical techniques.

0-11

Significance of Clip Readjustment in Aneurysm Surgery

J. H. Sung, S. W. Lee, B. C. Son, J. T. Hong, S. H. Yang, I. S. Kim, C. K. Park
Department of Neurosurgery, St. Vincent's Hospital, The Catholic University of Korea, Suwon, Korea

Introduction Compared to endovascular therapy, the main strengths of surgical clipping are immediate exclusion of aneurysm from normal cerebral circulation and its long-term durability. To meet this purpose, the final step of surgical clipping can not be overemphasized. We retrospectively evaluate the types and characteristics of post-clipping readjustment procedure.

Methods A 178 surgically clipped aneurysms (153 patients) were enrolled for this study. To meet the purpose of this study, non-clipping cases such as wrapping or excision were excluded. We reviewed medical operation records with sophisticated aneurysm and clipping profiles, video tapes and motion pictures. We categorized post-clipping readjustment procedures as follows: simple adjustment (S), gentle traction of the dome using microbayonet (B), gentle compression of the parent artery (C), change of clip applier (A) and removal and change to another clip (R).

Results Mean age was 52.9 ± 11.5 years. Female predominance was definite (male 43, female 110). Readjustment was performed in 115 aneurysms (64 %). The most common type of readjustment was simple adjustment (57 cases = 49.6 %). Microbayonet was used for remnant sac control (22 cases = 19.1 %) and the most frequent use was for Acom aneurysms. Gentle compression of parent artery had no site preference (6 cases = 5.2 %). Change of clip applier, one technical tip of simple adjust, was frequently used (26 cases = 22.6 %). Failure or inadequacy of the initial clip eventually resulted in removal and change to another clip (14 cases = 12.2 %). In large aneurysms, multiple types of readjustment procedures were used. Procedure-related complications (7 cases = 4.6 %) were Bemsheet wrapping-induced pseudoaneurysm (1 case), slippage and expire (1 case), compromise of parent artery (3 cases), slippage and reoperation (1 case) and slippage and coiling (1 case).

Conclusion Various clip readjustment procedures should be mastered and performed if any doubt of initial clipping is suspected. It can be performed safely and effectively with promising long-term durability.

0-12

Risk of Stroke with Temporary Arterial Occlusion in Craniotomy for Cerebral Aneurysm

D. J. Lim, J. Y. Park, S. D. Kim, S. K. Ha, S. H. Kim, Y. G. Chung
Department of Neurosurgery, Korea University Medical Center, Seoul, Korea

Purpose This study was performed to investigate technical and patient-specific risk factors for perioperative stroke in patients undergoing temporary arterial occlusion during the surgical repair of their aneurysms.

Method Ninety-five consecutive patients in whom temporary arterial occlusion was performed during surgical repair of an aneurysm were retrospectively analyzed. Inadvertent permanent vessel occlusion was identified in six cases and these were excluded from further analysis. The demographics for the remaining 89 patients were analyzed with respect to age, neurological status on admission, aneurysm characteristics, duration of temporary occlusion, and number of occlusive episodes; end points considered were outcome at 3-month follow-up.

Results Mean duration of temporary arterial occlusion (TAO) was 15.8 minutes (3–48 min). Overall, 16.3 % of patients experienced symptomatic stroke and 27 (29.3 %) had radiological evidence of stroke attributable to temporary arterial occlusion. Timing of surgery was a significant factor for the development of stroke as well as for the clinical outcome, early surgery was a significantly negative variable. In patients with TAO > 10 minutes, the incidence of stroke was significantly higher than in those with shorter TAO. Patients with repeated TAO, which allowed reperfusion, showed lower incidence of stroke than those with long single TAO > 10 minutes.

Conclusion From this study, we concluded that TAO is a safe technique for periods < 10 minutes, but if a longer period is needed intermittent TAO with reperfusion would be helpful. Attention might be paid to patients who underwent early surgery due to a high incidence of postoperative symptomatic stroke attributable to TAO.

0-13

Surgical Outcome of Aneurysmal Subarachnoid Hemorrhage of Elderly Patients

D. J. Lim, T. H. Kwon, H. S. Chung, H. K. Lee, Y. G. Chung, J. Y. Park
Department of Neurosurgery, Korea University Medical Center, Seoul, Korea

Purpose The number of elderly patients with cerebral aneurysms has markedly increased. We investigated the clinical characteristics and the surgical outcomes of cerebral aneurysms of elderly patients > 65 years compared with those of a control group < 65 years.

Materials and Methods From March 1999 to May 2005, 680 patients with aneurismal subarachnoid hemorrhage (SAH) were treated, among them 90 patients (13.2 %) > 65 years with SAH. The results of this sub-group are presented.

Results Mean age was 69 years (range 65–84 years), 73 patients (81 %) were female. 76 % of the patients were in (Hunt & Hess) grade I–III. Fourty aneurysms (36 %) had their origins at the anterior communicating artery, and 15 patients (16.7 %) had multiple aneu-

rysms. Treatment consisted of neck clipping in 91 aneurysms, endovascular therapy in 11 aneurysms, 58 patients (64.4 %) showed favorable outcome and the overall mortality rate was 14.4 %. The main causes of unfavorable outcome among elderly patients were attributed to their poorer Hunt-Hess grades on admission and concurrent intracerebral hematoma.

Conclusions We conclude that old age is not a contra-indication for aneurysm surgery and early craniotomy can lead to a better outcome in elderly patients.

0-14

The Use of Brain Tissue Oxymetry in Patients After SAH

M. Smrčka[1], K. Ďuriš[1], E. Neuman[1], V. Juráň[1], O. Baudyšová[1], R. Gál[2]
[1]Neurosurgical Department, [2]Anesthesia Department, University Hospital Brno, Masaryk´s University Brno, Czech Republic

Introduction The aim is to evaluate the monitoring of perioperative and postoperative ischemic episodes in patients after SAH (subarachnoid hemorrhage).

Material We studied 35 patients, 14 males and 21 females, between 38 and 76 years (mean 52.6 years). Severity of SAH: HH 1: 7 patients, HH 2: 7 patients, HH 3: 11 patients, HH 4: 4 patients, HH 5: 6 patients. Distribution according to outcome: death (GOS1): 9 patients, bad outcome (GOS 2 and 3): 11 patients, good outcome (GOS 4 and 5): 15 patients. Patients were operated in 26 cases, 8 patients were treated by coiling and 1 patient died before any treatment. We have a perioperative record in 24 cases (17 ACM and 7 ACoA aneurysms). A temporary clip was used in 17 cases. The parameters of cerebral oxygenation were monitored both peri- and postoperatively. Global and regional cerebral oxygenation was monitored by jugular bulb oxymetry and brain tissue oxymetry (PbtO2), respectively. The local flow was detected by the contact microvascular dopplerometry and transcranial dopplerometry. Patients with severe SAH were maintained at mild hypothermia (34 °C) both peri- and postoperatively, the other patients had mild hypothermia during operation only.

Results Summary of perioperative records: in the group of patients with temporary clip there was an average value of perioperative PbtO2 of 20,25 (SE = 7.5) mmHg while in the group of patients without temporary clip there was an average value of perioperative 23.87 PbtO2 (SE = 7.1) Torr. This difference was not statistically significant. In all cases, we detected a decrease of PbtO2 values after application of a temporary clip. Five minutes after applying a temporary clip PbtO2 decreased by 26 % of average value just before this maneuver. GOS of patients with ischemic episodes during the operation was not significantly different of those without these episodes.

Summary of postoperative records: PbtO2 in the groups HH1,2, HH3 and HH4,5 are similar until day 7 after SAH (22 mmHg on average), then around day 11 the values in group HH1,2 increase to 32 mmHg on average, values in group HH 3 continued at the same level while the values in the group HH 4,5 decreased to approximately 8 mmHg. PbtO2 in the group GOS 1, GOS 2,3 and GOS 4,5 are also similar until day 7 (25 mmHg on average), then around day 11 values in group GOS 4,5 increase to 35 mmHg on average, values in group GOS 2,3 continued at the same level while the values in group GOS 1 decreased to ca 12 mmHg.

There are no significant differences in PbtO2 values between the groups of operated patients and the group of coiled patients.

Conclusion Good outcome is associated with PbtO2 values > 20 mmHg, while poor outcome is associated with PbtO2 values < 20 mmHg in the long-term post-SAH period. Our current observations show that brain tissue oxymetry might be advantageous in the early detection of ischemic changes both peri- and postoperatively.

Acknowledgement: Research is supported by a grant of the Internal Grant Agency of Ministry of Health of the Czech Republic No 8837-3 and by a grant of University Hospital Brno 7/06.

0-15

Intraoperative Digital Subtraction Angiography vs Indocyanine Green Angiography During Cerebral Aneurysm Surgery

A. Gruber, C. Dorfer, H. Standhardt, G. Bavinzski, E. Knosp
Department of Neurosurgery, Medical University of Vienna, Austria

Introduction The purpose of this study was to analyse the advantages and possible shortcomings of indocyanin green angiography in comparison to standard intraoperative digital subtraction angiography during cerebral aneurysm surgery.

Methods Between July 2007 and May 2008, 44 patients underwent microsurgical clipping of cerebral aneurysms using both intraoperative digital subtraction angiography and indocyanin green angiography for intraoperative assessment of aneurysm occlusion and parent artery patency. Patient demographics, clinical data, and intraoperative findings were prospectively collected.

Results Intraoperative angiography was technically possible in all cases. Indocyanin green angiography was performed pre- and post-clipping of the aneurysms; 50 mg of indocyanin green dye (ICG-PULSION, PULSION Medical Systems AG, Munich, Germany) were used intravenously for every examination. Intraoperative angiography documented the occlusion of the ipsilateral pericallosal artery after clipping of an anterior communicating artery aneurysm in one case. ICG angiography detected insufficient clipping with very low leakage of dye into an anterior communicating artery aneurysm in one case. In general, the intraoperative information obtained from ICG angiography was important in all cases. The quality of ICG angiograms depended on the amount of cisternal blood in cases of recent aneurysm rupture. Important limitations were deep aneurysm location at the basilar tip, where ICG activity was often poorly detectable, and atheromatous plaques on the parent artery wall, which prevented ICG detection. In contrast to digital subtraction angiography, ICG angiography does not provide information about the vasculature not dissected and/or not within the operative field of the surgeon, i. e. information about the arterial flow pattern is limited. On the other hand, ICG provides instant information about parent artery patency as seen from the surgical viewpoint, i. e. interpretation of ICG results is straight forward in the majority of cases.

Conclusion Intraoperative indocyanine green angiography is a non-invasive technique providing instant information about critical aspects of aneurysm surgery, e. g. aneurysm occlusion and parent artery patency. The limited field of view, restricted to the operation field, remains a significant shortcoming of the procedure.

0-16

Indications for Decompressive Hemicraniectomy after Aneurysmal Subarachnoid Hemorrhage

C. Dorfer, E. Knosp, A. Frick, A. Gruber
Neurosurgical Department, Medical University of Vienna, Austria

Objective To present our experience with decompressive hemicraniectomy (DHC) in patients suffering from intractable intracranial pressure for various reasons after aneurismal subarachnoid hemorrhage (SAH).

Methods We retrospectively reviewed our SAH patient population, in whom DHC was performed at the Neurosurgical Department of the Medical University of Vienna between 1995 and 2007.

Results Twenty patients (mean age 47.5 years; range: 34–65) suffered from intractable ICP from VSP-related territory infarction and post-SAH brain edema and required DHC 7.8 days after aneurismal bleeding (H&H1: 5.0 %; H&H2: 15.0 %; H&H3: 25.0 %; H&H4: 40.0 %; H&H5: 15.0 %). At long-term clinical follow-up (17.2 mo; ranges: 0.3–121 mo), only one patient (5 %) reached an mRS 2, eight patients (40 %) were graded as mRS 3–5, and ten patients (50 %) were dead (mRS 6).

In 46 patients (mean age 50.0; range: 18–70), DHC was performed for associated ICH (40/86.9 %), SDH (3/6.5 %) and ICH/SDH (3/6.5 %).

The vast majority of these patients (33; 71.7 %) presented in a bad clinical condition (H&H grade 4–5). In 29 patients (63.0 %), DHC was performed within 48 h of bleeding, resulting in a mean mRS of 4.2 at follow-up (mean 21.0 mo; range: 0.2–130 mo). In the remaining 17 patients (37.0 %), decompression was performed after 48 h of onset with a mean mRS of 4.1.

Conclusion DHC can prolong short-term outcome, but the overall quality of life is poor and it should therefore be indicated restrictively.

O-18

Lamina Terminalis Fenestration – Effective Management for Reduction of Hydrocephalus after Aneurysmal SAH

M. Vaverka, D. Krahulik, L. Hrabalek
FNO Olomouc, Czech Republic

Introduction A hydrocephalus requiring shunt placement is a well-known and common complication after subarachnoid aneurysmal hemorrhage (SAH). Although the incidence of chronic hydrocephalus post-aneurysmal SAH has not been clearly established estimates range around 25 %.

The pathogenesis of hydrocephalus after SAH is multifactorial. However, early compromise of cerebrospinal fluid (CSF) circulation by subarachnoid and cisternal hematomas and subsequent block by subarachnoid fibrosis have been identified as the most important contributing factors.

Early surgical treatment (clipping) and early endovascular treatment (coiling) are now used and results of present studies indicate that the treatment method used does not affect the risk of later development of a chronic shunt-dependent hydrocephalus.

Previous investigations suggest that a fenestration of the lamina terminalis (FLT) during microsurgical procedure may be associated with a reduced rate of shunt-dependent hydrocephalus. The changed direction of CSF flow in the acute phase after SAH, when the blood is still in the subarachnoid space, does open up the subarachnoid channels and completely wash out the rest of the blood. It is important to prevent the occurrence of slowing or blockade of CSF circulation in some subarachnoid compartments, resulting in blood clots and later scarring of the arachnoidea and subarachnoid fibrosis.

Method The cohort of 73 pts was prospectively followed up. Basic characteristics were as follows: average age 55 yrs, H&H 2.6, Fisher 3.1, GCS 11 at admission. All patients were operated on the early surgery principles, mostly within 12 hrs after SAH. Lumbar drain was regularly used as the first step of surgical procedure. Lamina terminalis was fenestrated just after opening the dura and after relaxation of the brain was continued with conventional microsurgical procedure in all aneurysms in the anterior circulation. Regular CT scan was performed in the 2nd week after SAH and 2 and 6 months after.

The authors also studied 25 cadavers in the condition, which simulated surgical approach the neurovascular relationships in lamina terminalis region and histological specimens also.

Results In this group, the chronic hydrocephalus had developed in 4 cases – 5.5 %, 3 pts needed a VP shunt –frequency of shunt dependency was 4.1 % only.

Anatomical studies confirmed the safety consideration of FLT.

Conclusion The goal of this study was to confirm the positive influence of opening the lamina terminalis on the development of chronic shunt-dependent hydrocephalus, because live discussion still continued.

The authors recommend opening of the lamina terminalis in the anterior circulation as the safe and standard maneuver for two reasons: the effective relaxation of the brain at the beginning of the surgical procedure and effective prevention of development of a chronic hydrocephalus.

Session III: Neuroimaging: Morphology and Function

O-19

Comparison of Chemical Shift Imaging and Methionine Positron Emission Tomography for Neurosurgical Tissue Sampling in Diffuse Gliomas

G. Widhalm[1], S. Wolfsberger[1], M. Krssak[2], G. Minchev[1], A. Wöhrer[4], W. Dietrich[1], S. Asenbaum[3], E. Knosp[1], J. A. Hainfellner[4], D. Prayer[2]
Departments of [1]Neurosurgery, [2]Radiology, [3]Nuclear Medicine and [4]Institute of Neurology, Medical University Vienna, Austria

Introduction Standard imaging of diffuse gliomas (CT, MRI) frequently is not able to visualize the most malignant areas within the tumor. Therefore, positron emission tomography (PET) imaging using (11)-methionine (MET) or other amino acid tracers has emerged as gold standard. However, PET is expensive and not widely available. In recent years, chemical shift imaging (CSI) has evolved as a promising technique that can be performed in the frame of standard MRI and is thus a readily available investigational tool. Like PET, CSI (choline/creatine (Cho/Cr) and choline/N-acetylaspartate (Cho/NAA)) allows for intra-tumoral detection of metabolically active areas in diffuse gliomas. In the present exploratory study, we investigated the clinical usability of 2-D CSI for detection of intratumoral hotspots in diffuse gliomas and topographically compared 2-D CSI with MET-PET hotspots.

Methods Between 7/07 and 6/08 15 patients (median age 34 years, range 16–66 years) with a diffuse glioma were treated at the neurosurgical department of the Medical University of Vienna: 8/15 patients with suspicion of a primary low-grade glioma (LGG) and 7/15 patients with suspected tumor progression of a histologically proven LGG. All patients received preoperatively an MET-PET and 2-D CSI at a 3 Tesla clinical scanner. Image-Fusion with MRI, 2-D CSI (Cho/Cr and Cho/NAA) and MET-PET were conducted and correlation of 2-D CSI and MET-PET hotspots was performed (2-D CSI/MET-PET hotspot: > 50 % overlap, < 50 % overlap and distant).

Results Tumor location was the insular cortex (6), the central region (4), the frontal lobe (4) and the parietal lobe (1). In 10/15 patients, a gross total resection, in 2/15 patients a subtotal resection and in 3/15 patients a biopsy was performed. Histological examination revealed WHO grade-III tumors in 11/15 patients and WHO grade-II tumors in the remaining cases (7 oligodendrogliomas, 4 astrocytomas, 4 mixed oligoastrocytomas). An intratumoral hotspot was present in all patients with 2-D CSI and in 12/15 patients with MET-PET. Three patients with negative MET-PET were all WHO grade-III tumors. Topographical correlation of 2-D CSI and MET-PET revealed a hotspot overlap > 50 % in 11/12 patients and an overlap < 50 % in 1/12 patients.

Conclusion Our data demonstrates that 2-D CSI is a clinically reliable technique for visualization of intra-tumoral hotspots in diffuse gliomas. Topographical correlation of 2-D CSI and MET-PET hotspots revealed a significant overlap (> 50 %) in the majority of our patient cohort. In selected cases, 2-D CSI seems to be more sensitive than MET-PET with regard to the detection of malignant intratumoral areas.

O-20

Positron Emission Tomography (PET) Imaging-Based Treatment Algorithm for Cerebral Glioma Management

K. Roessler[1], M. Donat[1], M. Cejna[2], A. Becherer[3]
[1]Neurosurgical Department, [2]Radiological Department and [3]Department of Nuclear Medicine, Academic Teaching Hospital Feldkirch, Austria

Objective The management of radiologically suspected cerebral gliomas, especially with low-grade imaging features, is still a matter of debate. A retrospective study was undertaken to analyze the im-

pact of 18F-FDG ([18F]2-fluoro 2-desoxyglucose) and 18F-FET ([18F]fluoroethyl-L-tyrosine) PET for treatment decision.

Methods Twenty-four patients (mean age 38, range 2–71 yrs) with suspected cerebral gliomas in MRI investigations had both FDG and FET PET studies prior to treatment decision. PET uptake pattern was correlated to histology in surgical patients or radiological follow-up behavior in observational patients.

Results In 9 patients, both FDG and FET uptakes were negative, correlating with gliomas as incidental findings without symptoms, advised for observation. During a mean follow-up period of 6.8 months (range 2–15 months), no radiological progression was detected. Two patients were operated on, one because of large size, the other for epilepsy. Both were diagnosed as benign lesions (PXA I, Astro II). Eight out of 10 patients with strong FET uptake were resected and showed high-grade histology (4 Astro III, 2 Oligo III, 2 GBM). Both patients with strong FDG uptake had malignant gliomas. Three patients with small lesions without FDG and strong FET uptake are currently under observation.

Conclusion Negative FET and FDG PET imaging in suspected cerebral gliomas correlates with lack of progression in our study. Strong FET PET uptake correlates with high-grade histology in most of our patients. PET imaging in patients with suspected cerebral gliomas may facilitate the selection of patients for urgent surgery versus observation.

0-21

The Importance of Methionin-PET, CT and MRI Image Fusion 3D Target Volume Determination for Iodine-125 Interstitial Irradiation of Recurrent A2 Gliomas

V. Arpad[1,2], T. Major[3], Z. Kolonban[2], M. Sramka[4], J. Julow[2]
[1]Semmelweis University Doctoral School, Budapest, Hungary; [2]St. John's Hospital, Department of Neurosurgery, Budapest, Hungary; [3]National Institute of Oncology, Department of Radiotherapy, Budapest, Hungary; [4]St. Elisabeth University of Health and Social Sciences and St. Elizabeth Oncological Institute, Department of Stereotactic Radiosurgery, Bratislava, Slovakia

Introduction Between 1996 and 2006, 21 patients with low-grade gliomas WHO Grade II were treated with stereotactic brachytherapy using low-dose Iodine-125 isotope seeds at the Department of Neurosurgery, St. John's Hospital, Budapest, Hungary.

Method In 12 cases, the target volume was determined using Methionin-PET, CT and MRI image fusion, while in 9 cases the target volume was determined using CT and MRI image fusion.

Results The median survival rate for patients whose target volume was determined using Methionin PET, CT and MRI image fusion was 67.5 months, for patients whose target volume was determined using CT and MRI image fusion it was 39 months. There was a significant difference between values of the survival for two groups of patients ($p = 0.0035$). We found a significant deference between values of target volume determined by Methionin-PET, CT and MRI and determined by CT and MRI image fusion ($p = 0.004$).

Conclusions Image fusion using Methionin-PET, CT and MRI examinations was very effective in the irradiation of low-grade gliomas WHO Grade II. In 6 cases, irradiation could be done only with the help of Methionin-PET, CT and MRI image fusion, because the tumor often cannot be seen on the CT and MRI images.

0-22

Resection of Malignant Brain Tumors in Eloquent Areas Using 5-ALA Combined With Navigation Based on fMRI, DTI and Intra-Operative Cortical Stimulation

G. C. Feigl, R. Ritz, A. Gharabaghi, K. Ramina, M. Tatagiba
Department for Neurosurgery, University Hospital Tübingen, Germany

Objective Several studies have revealed that a gross total resection (GTR) of malignant brain tumors has a significant influence on survival of patients. However, a GTR can frequently not be achieved because in infiltration zones of malignant brain tumors the borders between healthy brain tissue and tumors are blurred. Especially in eloquent areas resection is frequently stopped before total removal is achieved in order to avoid deficits. 5-aminolevulinic acid (5-ALA) has been shown to help visualize tumor tissue intra-operatively and by that means to significantly improve the possibility to achieve a GTR of glioblastomas.

It was the aim of this study to go one step further and evaluate the usefulness and limitations of performing navigation-guided tumor resections of glioblastomas in eloquent areas based on multimodal functional imaging data in combination with 5-ALA.

Methods Eight patients with glioblastomas in eloquent areas were included in this prospective study. Pre-operative neuroradiological examinations of all patients included MRI with MPRAGE, fMRI as well as DTI sequences to visualize functional areas and fiber tracts. Imaging data was analyzed off-line, loaded into a neuronavigation system and used intra-operatively during resections. Localization of functional areas and fiber tracts were verified by cortical stimulation intra-operatively. All patients received 5-ALA 6 hours before surgery.

Results A GTR could be achieved in 6 patients under preservation of all functional areas and fiber tracts. None of the patients suffered from new neurological deficits after surgery.

Conclusion Our preliminary results show that tumor resections with 5-ALA in combination with multimodal functional imaging data and cortical stimulation add to the advantages of all three methods and by that offer additional security for the neurosurgeon during resection of glioblastomas in eloquent areas. However, additional studies are necessary to further evaluate the advantages of this strategy.

0-23

Preoperative Functional MR Imaging in Patients with Brain Tumors

P. Bednarik[1], T. Svoboda[3], R. Marecek[2], M. Kostalova[4], M. Mikl[2], M. Brazdil[2], P. Krupa[1]
[1]Department of Medical Imaging and [2]First Department of Neurology, St. Anne's Faculty Hospital in Brno, Masaryk University, Czech Republic; Departments of [3]Neurosurgery and [4]Neurology, Faculty Hospital Brno, Masaryk University, Czech Republic

Introduction Functional magnetic resonance (fMRI) is a method providing information about the localization of cortical brain areas activated during performance of motor and language tasks. Unfortunately, the sensitivity for sites critical for language and motor function is affected by lesion-induced effects on BOLD response. Hence, fMRI is unable to substitute entirely for direct cortical stimulation (DCS). In spite of this we want to show the utility of preoperative mapping in surgical treatment of patients.

Methods We performed preoperative fMRI in 15 patients with intracerebral brain tumors. We used a battery of tasks in 7 patients mapped for motor cortical areas. Motor tasks were selected with respect to the severity and localization of the neurological deficit. In order to display language-associated cortical areas (6 patients) we designed a visually presented task based on detection of semantically incorrect sentences („semantic decision task"). The incorrect sentence was made by phonemic exchange. Additionally, patients were tested using a commonly used battery of tasks including a verbal fluency task, a sentence comprehension task and a story listening task.

Two patients were tested for both language and motor cortical areas.

The resection of the tumor was monitored with DCS (10 patients). The critical the cortical sites identified during either classical or awake craniotomy were correlated with areas of activation obtained preoperatively.

Results In the motor group of patients we found good correlation between cortical stimulation and fMRI results in 3 cases. In 2 patients deep intrasulcal activation showed usefulness of fMRI in navigation of the cortical electrode. 2 patients were eventually treated conservatively.

In patients examined for language cortical areas we found good correlation between fMRI and DCS in three cases. Cortical stimulation failed in one case as a result of the patient's low compliance during awake surgery. fMRI estimated cortical reorganization or atypical right language dominance in two patients in agreement with subsequent DCS.

Our paradigm „phonological semantic decision task" was in agreement with the verbal fluency task in the determination of the language-dominant hemisphere in all our patients. This task seemed to provide a more consistent pattern of activation in comparison to other tasks.

Conclusion Our results indicate that fMRI and DCS are complementary methods. FMRI is able to navigate DCS and allows to consider lateralization of language function which is important in surgical planning.

We used the "semantic decision task" which allows us to control patients' responses. This paradigm is potentially able to substitute for the battery of tasks which are used in combination in order to increase the sensitivity of preoperative language mapping.

0-24

Diffusion Tensor Tractography Combined with Subcortical Electrostimulation – Precise Identification of the Corticospinal Tract

R. Bartoš, A. Zolal, M. Sameš
Department of Neurosurgery, University of Jan Evangelista Purkyně, Masaryk Hospital, Ústí nad Labem, Czech Republic

Introduction The use of diffusion tensor tractography (DTT) in intraoperative neuronavigation has become relatively well-established as a method of protecting eloquent white matter tracts during tumor resection. However, like every method, it has its limitations – a successful and accurate reconstruction of a fiber tract can be hindered by the presence of peritumoral edema or tumor infiltration, the accuracy of fiber tract navigation during the operation is most frequently negatively affected by the brain shift caused by tumor tissue removal. The use of subcortical electrostimulation in addition to DTT navigation provides the surgeon with a precise tool for identification of eloquent fiber tracts without the need for the often time-consuming and inaccurate navigation update procedures.

Methods 13 patients harboring a tumor or an AVM (2 metastases, 2 AVMs, 2 LGGs, 7 HGGs) close to or directly in the primary motor cortex were operated on with the use of DTT of the corticospinal tract (CST) in neuronavigation in 2008 at our institution. Preoperative motor weakness was present in 7 of these patients. In 7 cases, the surgeon decided to use subcortical electrostimulation in order to verify the results of DTT during the resection.

Results Subcortical stimulation elicited motor response in 4 cases. The position of the stimulated area was verified using the neuronavigation system and found to be in accordance with DTT findings. Resection was in a safe distance from the displayed CST in 2 cases, and no response was elicited with subcortical electrostimulation. In one case, no response could be elicited even though the neuronavigation system indicated close proximity of the resection to the displayed CST. Of the 13 patients operated with the use of DTT corticospinal tracts, 1 new mild hemiparesis combined with a hemineglect syndrome was noted in 1 patient (AVM) in the postoperative course, no other new motor deficits were observed. In 4 cases, preoperative motor weakness resolved incompletely in the postoperative course.

Conclusion Use of DTT tractography results in neuronavigation is relevant and reliable in most cases. In cases of uncertainty or in the presence of factors that could negatively affect the accuracy of DTT fiber tracts, subcortical electrostimulation should be used as a "gold standard" method to verify the extent of the resection.

This work was supported by a grant from the Ministry of Health, Czech Republic (IGA MZ ČR. NR8849-4/2006).

0-26

Early Cerebral MRI and Cerebral Perfusion CT in Comatose Patients with Brain Trauma

S. Reguli, R. Chutny
Department of Neurosurgery, Fakulty Hospitál of Ostrava Poruba, Czech Republic

Introduction Diagnostics and treatment of patients with heavy head trauma have undergone significant changes with the introduction of CT examination. It has allowed for early recognition and therapy of traumatic extravasations or contusions of the brain. In spite of its indisputable benefit, the native CT cerebral examination has certain limitations and is not able to display all relevant cerebral lesions. Some injuries elude upon CT examination from the topographic point of view (most injuries of the brain stem cannot be captured due to artefacts), others when it comes to time (input native CT does not capture the scope of damaged tissue – contusion is poststained after 24 or 47 hours, when it is usually late to start effective treatment). The modality allowing for more detailed anatomic and functional imaging of the cerebral tissue is MRI. It allows for detailed evaluation of the medulla oblongata and pontomesencephalic structures, where even minor damage may have fatal consequences for the patient. In comatose patients after cranial trauma, it is possible – based on the scope of involvement of stem structures – to make an accurate prognosis of the outcome or the mortality, as appropriate (Firsching et al. Classification of severe head injury based on magnetic resonance imaging, Acta Neurochirurgica 2001; 143: 23–71). Based on the specified classification, it is possible to divide unconscious patients after heavy cranial injury into 4 groups:

- grade I: hemispheral lesion
- grade II: unilateral lesion of brain stem in any level with or without hemispheral lesion
- grade III: bilateral lesion of midbrain with or without supratentorial damage
- grade IV: bilateral damage of pont with or without any above-mentioned lesion

Mortality then grows from 14 % (grade I) to 100 % (grade IV), medium duration of coma from 3 days (grade I) to 13 days (grade III).

MRI uses this method to explain the persisting coma in patients where no cause can be recognized from the CT. This, to a certain extent, makes the importance of supratentorial lesions relative – even patients with relatively extensive hemispheral damage and intact stem structures have the chance to wake up from coma and vice versa, patients without obvious involvement of hemispheres (with an almost normal CT) with a finding of bilateral pont involvement in MRI come to no good in 100 %, as a rule. Another advantage of MRI is the opportunity to use special sequences with higher sensitivity for certain types of lesions. The FLAIR sequence (fast fluid-attenuated inversion recovery) shows the scope of contusion focus more accurately. DWI sequence (diffusion-weighted imaging) allows for very early detection of an ischemic focus around a fresh brain contusion based on identification of regions with reduced diffusion. A more detailed overview of perfusion in affected brain tissue is provided by post-contrast perfusion MRI.

The application of the above-mentioned NRI sequences in early diagnostics in patients after heavy cranial trauma appears to be very promising not only for prognosis, but also as a strong factor in determining early surgical treatment. Early evaluation of localization, scope and character of brain lesion and brain tissue perfusion then contributes to optimal selection of therapy (surgery vs conservative therapy, indication for ICP or rCBF sensor introduction).

Recently, attention has focused on the utilization of cerebral perfusion CT as an early examination in comatose patients with cranial trauma. The benefit of the examination is early recognition of potentially expansive brain contusions that cannot be captured by CT yet. Examination of perfusion characteristics of the surroundings of contusion foci can predict potentially dangerous contusions with a threatening mass effect and provide an early indication of potential decompression surgical treatment. Waiting for signs of expansion of the contusion in necking native CT or clinical signs of progress – anisocoria, aggravated lateralization, mean loss of time and likelihood of worse result. In the event of experienced conus condition,

the ischemic brain tissue is gone forever. Early indication of external decompression or power of conservative treatment may alleviate the secondary insult and improve the general outcome in patients after cranial trauma.

Objective Evaluation of benefit of early cerebral MRI in comatose patients after cranial trauma – benefit for therapeutic consideration (indication for external decompression), prognostic value, mutual comparison of these two modalities and simultaneous comparison with input native brain CT. Exact evaluation of patients' outcome (Glasgow Outcome Scale, repeated neurological examination, percentage of indicated external decompression and time interval for performance of external decompression after injury) shall be allowed for by comparison with a parallel necking group of patients examined and treated by standard procedures, with performance of native brain CT only.

Material and Methods Selection of patients – patients in coma within 24 hours after cranial trauma – three subgroups
- patients who were not subject to early operation
- patients with early performed evacuation of extracerebral hematoma or contusion, as appropriate, without external decompression
- patients with early performed external decompression

In these patients, cerebral MRI shall be performed within 24 h after injury in T1, T2, DWI, perfusion modalities, and cerebral perfusion CT on the same day.

Inclusion criteria:
- interval within 24 h after cranial trauma
- GCS ≤ 8
- age from 18–80

Exclusion criteria:
- bilateral mydriasis
- known previous focal involvement of brain
- pacemaker
- renal failure
- known pregnancy

Subdivision into two groups:
- group with MRI – patients meeting the above-mentioned criteria with admission day being Mon, Tue, Wed, Thu
- reference group (without MRI) – patients meeting the above-mentioned criteria with admission day being Fri, Sat, Sun (thus two statistically comparable groups shall be formed)

Examination plan:
1. native cerebral CT (unless it has been performed as an input in another workplace)
2. early cerebral perfusion CT
3. early cerebral MRI including perfusion and diffusion weighing (within 24 h from injury)

The specified examinations shall be performed at our Radiodiagnostic Clinic according to an established protocol clinical examination (Glasgow Coma Scale [GCS], Glasgow Outcome Scale [GOS]) input GCS, GCS 1st–7th day (daily), GCS + GOS: 14th day, 3rd month, 6th month from injury.

Expected Benefit
1. Change of therapeutic strategy and indication of early decompression craniectomy (in 1st- and 2nd-group patients) according to findings in individual MRI modalities, which show the threatening serious secondary brain damage earlier than any detectable secondary structural lesion on CT.
2. Expressing the *quo ad vitam* prognosis based on detection of stem lesions capturable on CT.
3. Finding the correlation between MRI and perfusion CT allowing thus for subsequent use of perfusion CT in early detection of secondary brain damage.
4. Assessment of the effect of early external decompression indicated on the basis of MRI (comparison with checking group of patients in which MRI has not been performed).

Session IV: Neurotrauma

O-28

Injury of the Peripheral and Cranial Nerves – Unsolved Issues

E. Zverina[1,2], P. Haninec[2]
[1]Department of ORL, Head and Neck Surgery, 1st Faculty of Medicine; [2]Department of Neurosurgery, 3rd Faculty of Medicine, Charles University, Prague, Czech Republic

Introduction The aim of this study is to present problematics of peripheral and central nerve injuries with respect to unsolved issues and their possible solutions.

Methods The analysis is based on a study of clinical and research literature and personal experience gained during the past 37 years (1970–2007).

Results Waller discovered the law of degeneration and regeneration of peripheral nerves in 1852. Classification of injury grades defined by Seddon (1943) and Sunderland (1972) was another milestone. The present microsurgical era of tension-free suture spanning defects by autologous nerve graft was started in 1972 by Millesi, Samii and others. In the past 36 years, the technique has become a gold standard. In spite of these achievements basic issues remain unsolved. We are still not able to distinguish grade-II injuries not requiring surgery from grade-III injuries which must be operated unconditionally. Neither EMG nor MRI is capable of solving this problem. Unsatisfactory results may be seen in proximal nerve injuries, in thick nerve injuries, in long neural defects and after delayed operations. A factor accelerating regeneration is missing. Supply of autologous nerve transplants remains limited. Usage of non-autologous transplants has not been solved. Surgical results are generally deteriorated by intraneural aberrant cross regeneration especially in short cranial nerves. Cross regeneration between nerve axons and fascicles leads to synkinesis and autoparalytic syndrome due to antagonist innervation (n. III, n. VII, n. X). We are unable to reconstruct nerves with long glial, central portion, for instance n. VIII. Thus we solve such defects by auditory brain-stem implants.

Conclusion Tension-free suture using autologous nerve grafts belongs to the gold standard of peripheral nerve injury treatment today. Nevertheless, many unsolved problems remain. Future advances may be expected from basic neuroscientific research, gene and molecular engineering, nanotechnologies and research of stem cells.

O-29

Traumatic Posterior Fossa Extradural Hematomas

V. Balik[1], H. Lehto[2], D. Hoza[3], J. Hernesniemi[2], I. Sulla[1]
[1]Department of Neurosurgery, AD Centre, P. J. Safárik University, Faculty of Medicine, Kosice, Slovakia; [2]Department of Neurosurgery, University Hospital of Helsinki, Helsinki, Finland; [3]Department of Neurosurgery, University Hospital in Motol, Charles's University, Faculty of Medicine, Prague, Czech Republic

Background Post-traumatic epidural hematoma (EDH) in the temporal region is most common. Other locations are considered atypical. The aim of the presented study was outcome analysis of patients with EDH located in posterior cranial fossa (PFEDH).

Material and Methods A retrospective analysis (including demographic features, clinical/radiological pictures and outcome) of 24 patients with PFEDH treated at the Department of Neurosurgery in Helsinki, Finland, and at the Department of Neurosurgery, in Kosice, Slovakia, between January 1, 2000, and November 30, 2006, was made.

Results PFEDH represented 11 % of 209 EDH cases. Hemiparesis was the most frequent symptom in patients with PFEDH. The classical lucid interval was observed in only one of them (4.2 % of the group). Associated intradural lesions were present in more than half of patients. The best outcomes were observed in patients with Glasgow Coma Scale (GCS) 15–14 on admission. Approximately two thirds of them recovered completely and the rest was only moderately disabled at discharge. Persons in the fourth to seventh decade

of their lives and patients with concomitant intradural lesions had less favorable outcomes. Only patients with PFEDH and brain contusion recovered well. No patient of the group died. The least favorable outcomes (GOS) were reached by patients with PFEDH and simultaneous subdural or intracerebral hematoma, or both.

Conclusion The most significant factors influencing outcome in patients with PFEDH were GCS at admission, age and associated intradural lesions.

0-30

Post-Traumatic Peritentorial Hematoma

J. Polak, M. Moskała
Department of Neurosurgery and Neurotraumatology, Collegium Medicum, Jagiellonian University, Kraków, Poland

Introduction The increasing accuracy of diagnostic tools drew the authors' attention to the role of the tentorium cerebelli in neurotraumatology. There are many known clinical and radiological factors influencing the final outcome, but the findings in the region of the tentorium cerebelli have not been well described.

Methods We retrospectively analyzed clinical and radiological data of patients admitted to the Neurotraumatological Department, CM UJ, Kraków, from 2003–2007 with hyperdensity in the region of the tentorium cerebelli. 181 patients out of almost 2000 treated in the Department due to craniocerebral trauma were included in the investigated group. All patients had computer tomography performed on admission. In selected cases, magnetic resonance imaging was done. Additionally, autopsies were performed using a special technique for better recognition of blood location within the region of the tentorium.

Results Epidemiological data, mechanism of injury, neurological condition, coexisting intracranial pathology, sign of intracranial hypertension, outcome in GOS and NPI (Neuropsychiatric Inventory Test) at the time of discharge and after 6–12 months are estimated and matched against a control group.

Conclusions There are some data indicating that hematoma of the tentorium cerebelli are a predictive factor in head trauma. The mechanism of its influence on the final outcome may be the subject of delibaration – mainly shearing forces, the relative movement of fractured bone adjacent to the tentorium and tension arising between tentorium and the surrounding brain components.

0-31

Osteoplastic Decompressive Craniotomy

J. Mracek, M. Choc, Z. Mracek
Department of Neurosurgery, Charles University Hospital Pilsen, Czech Republic

Introduction Decompressive craniotomy belongs to standard neurosurgical interventions in the therapy for brain edema. Decompression is usually carried out by osteoclastic decompressive craniotomy (craniectomy) followed later by necessary plasty of the bone defect.

Methods In the case of osteoplastic decompressive craniotomy a free bone plate elevated by the cerebral tissue expansion is left in place. After edema disappearance, the bone plate returns to its original position and is reattached. Therefore, cranioplasty need not be performed.

Results We analyzed a ten-year set of 129 patients who had undergone osteoplastic decompressive craniotomy for brain edema under various pathological conditions. The patients' outcome was evaluated using the Karnovsky Performance Scale (39 %, > 70; 26 %, 30–70; 35 %, < 30) and Glasgow Outcome Scale (5, 19 %; 4, 20 %; 3, 26 %; 2, 13 %; 1, 22 %).

Conclusion Osteoplastic decompressive craniotomy is an effective method for treating brain edema when the degree of expansion does not require radical removal of the bone plate, thus, further surgery – bone defect plasty – is not needed.

0-32

Management of Anterior Skull Base Fractures with CSF Leak

C. Sherif, M. Krawagna, G. Widhalm, C. Matula
Neurosurgical Department, Medical University of Vienna, Austria

Introduction Detailed clinical outcome data for the management of CSF leak after anterior skull base fractures are rare. But mainly these data give evidence for the efficacy of the proposed algorithms. So this prospective study aimed to provide data for such a diagnosis/therapy algorithm.

Methods 138 consecutive patients with CSF leak after anterior skull base fractures treated at our department between 1995 and 2005 were evaluated. Neurological status, initial Glasgow Coma Score (GCS), β2-transferrin testing, high-resolution CT (bone window) and in cases of occult CSF leak, fluorescin and/or isotope examinations were performed. Patients with acute surgical indications were operated immediately via an intradural approach. All other patients were operated intradurally following clinical stabilization or in cases of CSF leak > 5 days following placement of lumbar drains. A 1-year follow-up with neurological examination, Glasgow Outcome Score (GOS), and CT (to assess for surgery-related postoperative frontal hypodensities) was performed.

Results 104 (75.4 %) patients were operated. 28 (26.9 %) patients with moderate/severe traumatic brain injury (TBI) were operated within 24 hours. 30 (28.9 %) patients with moderate/severe TBI with extensive brain edema/contusions were operated within 14 days after intracranial pressure stabilization (ICP < 15 cm H_2O). 46 (44.2 %) patients with mild TBI or delayed meningitis/brain abscess were operated after precise diagnosis > 14 days after trauma. The 1-year follow-up demonstrated 0 % mortality for moderate/mild TBI and 36.5 % GOS 5 for severe/moderate TBI patients. Postoperatively, 1.4 % of the patients developed meningitis and 3.8 % persistent CSF leak (managed with endoscopic re-operation). Equivalent anosmia and frontal lobe infarction rates were found in surgically and conservatively managed patients.

Conclusion In summary, the present algorithm using intradural and endoscopic approaches provided favorable clinical outcome data.

0-33

Outcome After Acute Head Trauma Needing Neurosurgical Intervention in Patients with Oral Anticoagulants or Anti-Thrombotic Agents

C. Auer, G. Wurm
Neurosurgical Department, Landesnervenklinik Linz, Austria

Objective The benefit-to-risk ratio of oral anticoagulation (OAC) and anti-thrombotic agents has been discussed over years in the medical literature. Even without any antecedent trauma, anticoagulation and especially over-anticoagulation can result in an intracranial hemorrhage. In case of head trauma, several studies have demonstrated that OAC and anti-thrombotic therapy are associated with a 7–10-fold risk of intracranial hemorrhage. However, there is little data in the literature on outcome after neurosurgical intervention of anticoagulated patients incurring head injury.

Methods This was a retrospective review of all medical records of patients suffering from acute head trauma who eventually needed neurosurgical intervention over a four-year period (between January 2003 and December 2006). There were 231 patients who met inclusion criteria. Ages ranged between 1 and 99 years (mean 48.9 years). Regarding the use of anticoagulants, 30 (13 %) were using OAC or anti-thrombotic medication (group 1); the remaining 201 (87.0 %) did not use these agents (group 2). Clinical follow-up could be obtained for 207 patients (89.6 %), 67 females and 140 males.

Results Mean age in group 1 was 73.1 years, mean age in the group 2 was 45.3 years ($p < 0.001$). Mean INR in group 1 was 1.8, and 1.2 in group 2 ($p = 0.059$). Quick levels, however, were significantly different between the groups ($p = 0.007$). Associated skull

fracture was present in 129 patients (55.8 %), 5 in group 1, 124 in group 2 ($p < 0.001$), thus, trauma was more severe in patients without anticoagulation. However, mortality was found in 20 of the 30 patients in group 1 (66.66 %), and in 61 of the 201 patients in group 2 (30.34 %) ($p < 0.001$). Concerning type of medication, mortality was 68.8 % in patients with OAC, and 64.3 % in patients with anti-thrombotic medication. Mortality was highest in patients with intracerebral hemorrhages (80 %) and lowest (8 %) in patients with epidural hematoma. Mean GOS was 4.11 in patients with anticoagulation and 2.72 in the patients without anticoagulation ($p < 0.001$). There was significant difference in GOS between comatose and non-comatose patients ($p = 0.002$). The fate of the surviving patients according to the Barthel Index, Karnofsky Score and clinical examination was quite favorable, even in group 1, when outcome was matched by age. There were no differences between groups concerning postsurgical neurologic deficit, headache and epilepsy.

Conclusion Age at trauma, comatose status, and intracerebral location of traumatic hemorrhage are still the most significant prognostic factors for outcome after trauma. OAC and anti-thrombotic therapy are associated with a significant risk of fatal outcome after surgically treated intracranial traumatic hemorrhage, especially in case of high-intensity anticoagulant therapy. Clinical outcome of survivors, however, seems to be equal in patients with and without OAC and anti-thrombotic therapy.

0-34

Posttraumatic Hydrocephalus

Z. Nová, J. Chrastina, I. Xíha
Department of Neurosurgery, FH St. Anns and MF MU in Brno, Czech Republic

Introduction The incidence of hydrocephalus after craniocerebral injury varies (Cardoso 1985: 0.7 %; Licata 2001: 29 %; Mazzini 2003: 45 % of trauma rehabilitation unit patients). There is a strong correlation between the severity of head injury as defined by initial GCS and the incidence of posttraumatic hydrocephalus (GCS 3– 8: 39.3 % patients with hydrocephalus, GCS 9–13: 27.3 % of hydrocephalic patients). Based on the time interval after primary injury posttraumatic hydrocephalus can be divided into acute (< 3 days), subacute (3 days to 1 month) and chronic (> 1 month).

Methods The possibilities of neuroendoscopy in the treatment of posttraumatic hydrocephalus are blood clot aspiration from the ventricular system, irrigation of ventricles, deliberation of foramen Monroi and aqueductal orifice, endoscopic third ventriculostomy aqueductoplasty, treatment of expansive pseudocyst together with possibly beneficial basal cistern irrigation after ETV. The surgical group consisted of 27 patients (22 males, 5 females, average age 47.6 years ± 15.0 years). Severe head injuries (GCS 3–8) prevailed (16 patients). 4 patients had a history if intracranial infectious complication before neuroendoscopic surgery.

Results Excellent or good outcomes were achieved in 44.4 % of patients available for follow-up. There were 5 deaths caused by the severity of the primary injury or organ complications in polytrauma patients. In 5 patients, shunt systems were implanted due to presumed cerebrospinal fluid malresorption with no influence on the outcome. According to the type of hydrocephalus, endoscopic treatment of chronic hydrocephalus was associated with better results (favorable outcomes 63.3 %) than acute hydrocephalus (33.3 % favorable outcomes). In individual patients, samples for histological evaluation were taken from the site of ETV and correlation between clinical outcome and histology was done.

Conclusions Before considering any surgical treatment, differential diagnosis between posttraumatic ventriculomegaly due to brain atrophy and active hydrocephalus should be made. The results achieved by neuroendoscopic treatment are comparable with literature data – 56 % of patients with good or excellent outcome (Pickard 2005). Neuroendoscopy plays a double role in the treatment of posttraumatic hydrocephalus – it is therapeutic and diagnostic. Visual verification of vital structure destruction is an indicator of poor outcome. Minimally invasive targeted neuroendoscopic surgery is well tolerated by severely injured patients occasionally with serious systemic injuries and may provide causal treatment of hydrocephalus of traumatic origin.

0-35

The Influence of Various Localized Brain Lesions on the Occurrence of Immune System Disorders and Extracranial Complications in Patients after Severe Brain Injury

A. Mrlian[1], M. Smrčka[1], M. Klabusay[2]
Departments of [1]Neurosurgery and [2]Haematooncology, Faculty Hospital, Brno, Czech Republic

Objectives Severe brain injuries affect the celullar as well as the humoral part of the immune system in affected patients. While the cellular part seems to be suppressed, immunoglobulins change depending on the occurrence of extracranial complications, except IgE levels, which are multiple raised with a tendency to further elevation. Immune system disorders probably cause higher occurrence of extracranial inflammatory complications that worsen the prognosis of the patients.

Material and Methods The aim of our work was to observe cellular and humoral immunity status in relation to various localized brain damages. We investigated 121 patients with incoming Glasgow Coma Scale ≤ 8 (subdural hematoma: 48 %; intracerebral hematoma: 42 %; epidural hematoma: 12 %).

Results In all patients, a notable defect of cellular immunity was detected, which led to a significant decrease of T-lymphocyte levels, including helper cells and cytotoxic/suppressor cells ($p < 0.01$). The decrease was succeeded by a higher appearance of inflammatory complications in 78 % of investigated patients. B-lymphocytes, NK cells and antibody IgM levels changed depending on an occurrence of inflammatory complications. Concerning immune system disorders and various localizations of brain damage a relevant difference was disclosed ($p < 0.001$). T-lymphocyte levels were lower in association with the left located damage and their gradual normalization was slower ($p < 0.01$). This decrease was succeeded by a higher occurrence of extracranial complications ($p < 0.01$) (pneumonia: 20 %) and finally it led to a higher mortality. B-lymphocyte levels were lower in the group with right located damage, but the difference was not significant. The humoral part of the immune system did not show any significant changes, either.

Conclusions However, various localizations of focal brain damage affect in a manner the immune system status in patients after severe brain injury. It is an important point in light of the occurrence of extracranial complications. It results in a higher mortality in the group of patients with left located damage.

0-36

Multimodal Brain Monitoring in Patients with Severe TBI and SAH

A. Hejčl[1], M. Bolcha[1], J. Procházka[2], M. Sameš[1]
[1]Neurosurgery Department, Masaryk Hospital, Ústí nad Labem, Czech Republic;
[2]Neurointensive ICU, Masaryk Hospital, Ústí nad Labem, Czech Republic

Introduction The therapy of patients with severe traumatic brain injury (TBI) is still insufficient, often resulting in poor outcome. This is partly due to limited information that we receive about the state of the brain using standard monitoring methods, such as intracranial pressure (ICP) monitoring.

Methods In 2005, we introduced tissue oxygen monitoring (Licox, Neurotrend) and microdialysis in patients with severe TBI (GCS < 9) at our neurointensive care unit. Tissue oxymetry was implanted either at the end of surgery or at the bedside at the ICU. Probes were fixed in a triple-lumen bolt or using the tunneling method. We implemented multimodal monitoring in 37 patients until May 2007. In 9 patients, we used ICP and tissue oxygen monitoring using either Neurotrend or Licox. In one patient, we used ICP and microdialysis. In 27 patients, we established multimodal monitoring using ICP, tissue oxygen monitoring (Licox) and microdialysis implanted unilat-

erally (n = 19) or bilaterally (n = 8). The group consisted of 28 males and 9 females with an average age of 48 (16–66), and an average monitoring time of 8 days (4 hours to 15 days). In the last 12 cases, we used the ICU Pilot software to help us analyze multimodal monitoring online.

Results Tissue monitoring using Neurotrend (n = 5) was associated with frequent technical problems, while the system Licox (n = 31) proved very reliable and easy to implement. The technique of multimodal monitoring is safe with no severe complications observed. We found that early signs of metabolism impairment, as indicated by the LP (lactate/pyruvate) ratio elevations, preceded ICP elevations, while the concentrations of glucose (decline to 0 mmol/l), glycerol (increase to values >> 100 µmol/l) and tissue oxymetry (values below 10 mmHg) changed only as the ICP rose. In patients with bilateral brain monitoring, in 50 % of cases brain tissue monitoring around the lesion was more sensitive to secondary insults than monitoring of the contralateral hemisphere.

Conclusion Microdialysis and tissue oxymetry as a part of multimodal monitoring are safe and reliable methods. Indicators of tissue metabolism impairment, especially the LP ratio, can predict intracranial pressure elevations. Implanting the probes near the injured site (biochemical penumbra) improves the sensitivity of multimodal monitoring.

Supported by IGA MZCR NR/8851-4/2006.

0-37

Monitoring of Brian Tissue Oxygenation after Craniocerebral Injury

J. Steindler, L. Pekar, M. Tichy, Z. Prikrylova, S. Jurcenko, M. Filaun
Departments of Neurosurgery and Anesthesiology and Intensive Care, Motol University Hospital, Prague, Czech Republic

Introduction Brain tissue oxygen monitoring plays an important role in the prevention of secondary brain injury. Final patient outcome may be predicted by the values of partial brain oxygen pressure ($p_{bt}O_2$) in the first hours after severe brain trauma. The aim of this study is to analyze the relation between early values of brain oxygen in severe head trauma and patient outcome one year after the traumatic accident. This study is a follow-up of our previous observations.

Methods Data of 18 consecutive adult patients treated in our ICU during a time period of 24 months for severe head trauma with a Glasgow Coma Scale (GCS) score ≤ 8 and with monitoring of intracranial pressure (ICP) and partial brain oxygen pressure ($p_{bt}O_2$) were analyzed. We placed sensors for $p_{bt}O_2$ monitoring at the same time as ICP sensors. The target of our treatment was to avoid ICP hypertension, to maintain cerebral perfusion pressure > 60 mmHg and to reach optimal $p_{bt}O_2$ levels. In time intervals of 3, 6 and 12 months after trauma we compared data of the first hours of treatment in the ICU with the neurological status using the Glasgow Outcome Scale (GOS) in all patients. At the time of data comparison none of these patients was treated in our hospital.

Results The group with GOS 1 consisted of 4 patients at the time of leaving ICU and initial values of $p_{bt}O_2$ in the first 24 hours of treatment were 25.99 mmHg (mean). The group with GOS 2 had 5 patients and initial values of $p_{bt}O_2$ 19.91 mmHg (mean). From this group 4 patients died and one improved to GOS 3. The group with GOS 3 had 4 patients, initial values of $p_{bt}O_2$ 19.91 mmHg. From this group 3 patients improved to GOS 4 and 1 patient to GOS 5, both within 6 months. There were no changes in neurological status between 6 and 12 months after injury. No patients were in the group with GOS 4. The group with GOS 5 had 5 patients and initial values of $p_{bt}O_2$ 26.31 mmHg at a time of leaving ICU.

Conclusion Patients in a vegetative state at the time of leaving the ICU in our group had a poor prognosis. All patients with severe disability improved – the values of brain tissue oxygen in this group were below 20 mmHg. The group with GOS 5 had also relatively low values. Therefore, no clear relation between the initial values of brain tissue oxygen and the long-term outcome was found in our study. For the purposes of unambiguous and definite conclusion more cases would be needed.

Session V: Spinal Surgery

0-38

Operative Therapy of Lumbo-Ischialgia – Historical Comments

T. Kapapa, C. Grimm, D. Woischneck
Neurochirurgische Klinik, Bereich Safranberg, Universitätsklinikum Ulm, Germany

Introduction The surgical therapy of lumbo-ischiadic pain gains increasing impact in the European health system. There are diversified surgical methods to perform reduction of pain. However, sometimes the methods appear contradictory. This leads to questions regarding the causation of surgery and outcome. A historical digression should allegorize false surgical therapies due to scientific methods.

Method There are several international articles published in the 1920s and 1930s dealing with the surgical therapy of lumbo-ischiadic pain. These articles were written before knowledge of radicular pain syndromes caused by lumbal disc herniations increased. We reviewed these papers systematically and performed statistical evaluations of the surgical results.

Results

1. Pathophysiological theories: based on the knowledge of internal and neurological medicine of that time, lumbo-ischiadic pain was caused by nerval inflammations. To allow surgical therapy, different clinical pictures based on mechanical concepts were newly defined.
2. Indication: surgery was performed in patients with lumbo-ischiadic pain resistant to therapy. Physiotherapy, massage and antiphlogistic drug medication in a period of at least four weeks were required.
3. Surgical methods: with increasing risk, the following procedures were performed: decompression of the plexus brachialis from pelvic boe appositions, lumbo-sacral laminectomies on different levels, preparation of the N ischiadicus main root at the foramen piriforme and neurotomies of the N suralis.
4. Outcome: the best results were achieved by decompression of the N ischiadicus: 80 % of the patients were free of pain, 15 % had less pain, and 5 % had no changes. Mortality was not reported.

Discussion According to recent scientific criteria, senseless surgical methods could produce good outcome in lumbo-ischiadic pain as reported in the historical literature. The outcome corresponds to the findings of these days. Caution is advised for decompression of the N ischiadicus since it was recommended for patients with failed back syndromes in 2005.

0-39

Percutaneous Laser and Endoscopic Disc Nucleotomy and Percutaneous Spinal Interspinous Distraction as Exact Minimally Invasive Methods in Spinal Surgery

S. Hendryk[1,3], W. Szydlik[2,3], P. Bażowski[1], H. Doleżych[1], J. Sirek[3], R. Sirek[3]
[1]Department of Neurosurgery Silesian Medical University in Katowice; [2]Division of Neurosurgery Regional Hospital in Bytom; [3]Hospital of Cosmetic Surgery and Other Surgical Methods in Bielsko-Biała, Poland

Introduction Spinal and lateral foraminal stenoses are secondary to lumbar spinal disk disease and we frequently see these degenerative changes in elderly patients. The wide posterior decompression is associated with significant iatrogenic trauma and failed back syndrome. It is the main reason for the search for a minimally invasive method in spinal surgery.

Methods Among other modifications (endoscopic lumbar laser foraminoplasty and discectomy), the interspinous distraction device (In-Space) implanted through the percutaneous approach as an exact minimally invasive method has recently been introduced to spinal surgery. We used the percutaneous laser, endoscopic disc nucleotomy and percutaneous interspinous distraction adequate to patient's indication.

Results We present our experiences with performance of percutaneous laser and endoscopic disc nucleotomy in 120 patients with intact posterior ligament and predominance of low back pain and lumbar disc herniations; and initially with percutaneous spinal distraction in cases of degenerative spinal stenosis.

Conclusion We considered a percutaneous laser and endoscopic disc nucleotomy that is especially established as a gentle way of treating lumbar disc herniations with good results. Similarly, a minimally invasive method is interspinous spinal distraction via a percutaneous approach in the treatment of degenerative spinal stenosis. If classical microsurgical methods are needed these percutaneous minimally invasive methods do not interfere with the initial procedure.

0-40

Endoscopic Dilatation Set in Endoscopic Lumbar Discectomy

A. Sufianov, I. Iakimov, M. Zaitcev, G. Sufianova
East-Siberian Centre of Minimally Invasive Neurosurgery, Russian Academy of Medical Sciences, Irkutsk, Russia

Introduction Percutaneous endoscopic discectomy is one of the minimally invasive techniques for spine surgery. After mastering this procedure it is a practical method used for the treatment of a disc herniation. The outcome of percutaneous endoscopic discectomy for treatment of disc herniations has been studied.

Objective The evaluation of results on endoscopic discectomy.

Materials and Methods Operative treatment was performed on 10 patients (4 women, 6 men), average age 37.0 ± 2.4 years. Duration of the back painful syndrome in this group from years 3–5, duration of last aggravation from 1–6 months. The selected patients had no previous surgery, appropriate conservative therapies were done before operation, and MRI was the main diagnostic method with the clinical findings. Evaluation of the patients with clinical examinations, Visual Analogue Scale (VAS) for pain and the Oswestry scale were performed preoperatively, on postoperative day 7 and in the postoperative 6–12-month period. Quality of life of patients – Euro Quality of Life – 5D (Walker S 1993) which were estimated before operation, 5–6 days, 3 months, 6 months and 1 year after operation. Endoscopic lumbar discectomy was performed with the combined use of the endoscopic dilatation set for retraction of the paravertebral tissues and set by Destandau for the principal step.

Results Endoscopic discectomy was performed at level L4–L5 in 6 cases, L5–S1 in 3 cases, L2–L3, L3–L4 in 1 case. In one patient (n = 1, L4–L5) a dura was partially damaged. Follow-up was from 1–18 months. Mean VAS score for pain improved from 7.4 to 1.5, and mean ODI improved from 63.5 to 10.5. Average period of activation of the patient at endoscopic operation have made 1.5 ± 0.3 days. Average duration of stay in a hospital at endoscopic treatment have made 4.1 ± 0.1 days.

Conclusion Endoscopic lumbar discectomy by combination of the endoscopic dilatation set for retraction of the paravertebral tissues and set by Destandau for the principal step is an effective and safe method in the treatment of disk herniations with essentially reduced terms of activation and hospitalization of the patient, improves quality of life of patients and decreases the painful syndrome.

0-41

Lumbal Spinal Stenosis

V. Smrčka, M. Smrčka
Neurosurgical Department, Faculty Hospital Brno and Masaryk University Brno, Czech Republic

Introduction There are various types of lumbar stenosis. Acquired stenosis tends to become symptomatic in older patients for various reasons. Anatomically, stenosis may be classified as central, lateral or combined [1]. The classical history of central lumbar stenosis is characterized by many years of low back pain followed by neurogenic claudication [2].

Material The authors present their own series of 38 patients treated within the last 3 years. The patients were > 64 years of age and underwent operation for lumbal spinal stenosis. All patients, suffering claudications and low back pain, were examined by MR, functional X ray, neurological and electrophysiological analysis. Central stenosis was found in all cases, with a minimum diameter of 4 mm. In all patients in this group, laminectomy was performed, discogenic osteofytes, facet and ligamentous hypertrophy were also found.

Results Overall, good to excellent results were found in 90 % of cases, with the mean follow-up period of 1.5 years.

Conclusion Lumbal spinal stenosis in an older population can be successfully treated by laminectomy alone. Stabilisation in this group is not necessary, because the large osteofytes of the anterior column maintain stability. For the same reason, severe osteoporosis in some cases excludes metal stabilisation.

References

1. Westmark RM, Weinstein PR. Surgical management of lumbar spinal stenosis. In: Schmidek HH, Sweet WH (eds). Operative Neurosurgical Techniques: Indications, methods, and results. Grune & Stratton, New York, 1982; 1957–64.
2. Yoshida M, Shima K, Taniguchi Y, Tamaki T, Tanaka T. Hypertrophied ligamentum flavum in lumbar spinal canal stenosis. Pathogenesis and morphologic and immunohistochemical observation. Spine 1992; 17: 1353–60.

0-42

Experiences with Iso-C-3D©-Supported Navigation for Spinal Stabilisation

I. Decristoforo, K. Gugl, K. Ungersböck
Department of Neurosurgery, St. Pölten County Hospital, Austria

Objectives The efficacy of the Iso-C-3D© in combination with the Brain Lab Vector Vision© system for navigation of pedicle screws for dorsal stabilization will be evaluated in a prospective study and results in the first patients are presented.

Methods From March 2005 to May 2008, 76 patients had navigation-supported stabilization surgery at the spine. One patient had thoracic-3-level stabilisation and two had thoracic-5-level stabilisation. Three-level lumbar stabilisation was performed in 12 patients and 61 patients underwent two-level fusion. Overall, 342 pedicel screws were implanted. Fluoroscopic control was also used for screw implantation and in all cases a 3D scan was finally performed. Patients were positioned in prone position on a radiolucent carbon operating table. After real-time data acquisition by the Iso-C-3D© with the fixed navigation device on a spinal process at the region of interest in all cases the Brain Lab Vector Vision© system was used for navigated instrumentation. Patients are investigated after 1 and 6 weeks, 3 and 6 months as well as after 1 year.

Results Three dislocated screws out of 342 implants were depicted by 3D Scan interoperatively and corrected. In one patient, the last of four pedicel entry points was incongruous to the fluoroscopic control – it was caused by a loosening of the navigation device. The use of the Iso-C-3D© for navigation brings a slight prolongation of surgery time, but real-time data acquisition in prone position and easier definition of the screw length as well as easier localisation of the pedicel entry points is very comfortable for the surgeon. The received image quality for planning was not as excellent as with CT matching, but satisfying.

Conclusion Based on our experiences, the use of the Iso-C-3D© for intraoperative real-time image acquisition seems to be a safe and sufficient tool for spinal navigation.

0-43

Assessment of Ossification and Fusion Level Following Anterior Cervical Discectomy Using a Radiolucent Cage System. A Prospective Radiographic and Clinical Study. Preliminary Report

J. Andrychowski, K. Budohoski, Z. Czernicki, T. Netczuk
Department of Neurosurgery, Polish Academy of Sciences, Medical University, Warsaw, Poland

Introduction Difficulties connected with operational treatment of cervical symptomatic degenerative disc disease arise from its mobility and high risk of long-term complications in the form of progressive degeneration of adjacent segments and microinstability as a result of collapsed intervertebral spaces and low-rate bone fusion. In order to avoid symptom relapse durable fusion and restoration of the anatomical structure of the vertebral motor segment are a prerequisite. Techniques such as isolated discectomy and discectomy with autologous bone graft rely on the natural ability of bone tissue to regenerate and prevent the collapse of intervertebral space to a minimal degree, whereas implantation of cage systems with a central canal for osteoinductive materials both induce fusion to occur and keep the motor segment stable.

Aim The authors aimed to assess vertebral fusion and motor segment stability after anterior cervical discectomy and fusion (ACDF) using a radiolucent cage system and compare the results to ACDF with autologous bone graft from the ala of illium.

Material and Methods 18 patients operated for symptomatic degenerative disc disease in the cervical segment of the vertebral column were enrolled in the study. 9 patients, 4 female (mean age 55.5) and 5 male (mean age 52.6), underwent ACDF using a vertebral spacer Cervios (Synthes) and formed the analyzed group. 9 patients, 6 female (mean age 53.83) and 3 male (mean age 54.67), underwent ACDF using autograft from ala of illi bone and formed the control group. On admission all patients were evaluated for long-term complications using the Visual Analog Scale (VAS) and Neck Disability Index (NDI). For fusion and progressive degeneration of adjacent segments assessment Computed Tomography (CT) scans (1.25 mm layers), Single Photon Emission Computed Tomography (SPECT) and planar scintigraphy (MDA with technetium 99mTc, Diacam single-head gamma camera) were performed and analyzed. All tests were conducted between 5 months and 3 years post-operation.

Results Patients who underwent ACDF using vertebral spacer scored mean 2.22 in VAS and mean 6.66 in NDI whereas control group patients 4.66 and 16.22, respectively. CT scans revealed a decline in physiological cervical lordosis to a lesser degree in the analyzed group compared with controls. Described degenerative changes in analyzed group were less distinct than in controls and did not cause compression on cervical nerve roots, nonetheless were visible in 6 cases. Bone fusion and thus vertebral stability observed in CT, scintigraphy and SPECT were greater in patients with vertebral spacer than in controls.

Conclusions Vertebral stability resulting from bone fusion and the lack of intervertebral space collapse is greater in ACDF using vertebral spacer. Clinical symptoms evaluated with VAS and NDI correlate with radiographic and scintigraphic findings. Overall, ACDF with cage system seems to be a superior method having a lower risk of long-term complications, however further investigation is needed.

0-44

Cervical Arthroplasty: Lessons Learned after Implantation of 162 Disc Prostheses

M. Mühlbauer, K. Mahr, K. H. Pichler, W. Pfisterer
Department of Neurosurgery, Donauspital SMZ-Ost, Vienna, Austria

Introduction Cervical disc prostheses shall contribute to minimize symptomatic adjacent segment degeneration in anterior cervical disc surgery while achieving at least equal or better clinical and functional results compared with fusion. The aim of this study is to report our experience with 3 different types of cervical disc prostheses, and to critically reflect our learning curve with respect to indications and surgical technique.

Methods Between February 2002 and May 2008, a total of 162 cervical disc prostheses were implanted in 155 patients (110 Bryan, 14 Prestige, and 38 Discover). During the same period, 343 patients received carbon cages for disc replacement after anterior discectomy.

Results With respect to radicular pain, the clinical results were excellent in the arthroplasty group. Radicular dysaesthesia was noticed in several cases only, but neck pain was commonly reported after surgery.

No intraoperative complications occurred and no postoperative neurological motor deficit was recorded. 4 prostheses were removed (Discover), 2 because of remaining radicular pain (reason unknown), 1 for implant subsidence into the endplate, and 1 for anterior implant migration.

Post-operative kyphosis of the operated segment or of the prosthesis was frequently seen especially at the beginning of our learning curve. The main reasons for this biomechanical complication were poor indication with pre-operative kyphosis, hyperlordotic patient positioning on the OR table, non-parallel segment distraction, overmilling of the implant bed, and imprecise endplate preparation.

Implantation of the Bryan prosthesis required considerable additional surgery time and x-ray exposure. The Prestige required more powerful hammering than the 2 other types. The Discover required most precise endplate preparation.

Conclusion With our present experience we now restrict indications for arthroplasty to soft disc herniations and hard disc herniations with near-regular motion in the flexion/extension x-ray and with no kyphosis and no facet arthrosis. Of the 3 different types of prostheses in use in our department, the implantation of the Discover prosthesis is most "surgeon-friendly", but due to its simple ball-socket design it requires the most precise endplate preparation.

0-45

Cervical Arthroplasty with ProDisc-C vs Fusion with Cervios ChronoOS Prostheses

M. Vorsic, G. Bunc, V. Milojkovic, T. Strojnik
University Hospital Maribor, Slovenia

Introduction For a long time, the cervical anterior discectomy and fusion (ACDF) was a standard treatment for disc herniation and degenerative disc disease in patients whose conservative treatment failed. Since fusion may result in progressive degeneration of the adjacent segments, disc arthroplasty preserving the segmental motion and improving load transfer to the adjacent levels was introduced.

The aim of the study was to review early clinical results and radiographic outcomes following insertion of the ProDisc-C prostheses and Cervios chronoOS prostheses. The second aim was to determine the difference in the segmental motion and clinical results between both groups.

Methods In the prospective controlled study, 15 patients with cervical disc herniation were treated in either group. Patients in the first group were treated with complete anterior cervical discectomy and ProDisc-C disc arthroplasty. Overall, 12 single-, 2 two- and 1 three-level procedures were performed (19 prostheses). In the second group, patients underwent complete anterior cervical discectomy with fusion using Cervios chronoOS prostheses. 18 prostheses for 3 two-level and 12 single-level procedures were used.

Clinical outcomes were assessed using neuro-examination, Visual Analogue Scale and the Neck Disability Index. The range of motion and the angle of the functional segmental unit were determined radiographically by measuring the static and dynamic radiographs.

Results There was significant pain reduction in the neck and arm in both groups postoperatively, with slightly better results in the group treated with disc arthroplasty. Segmental motion was pre-

served in all patients after cervical arthroplasty and decreased in patients with fusion. In this group, the range of motion of the adjacent levels was preserved.

Conclusions ProDisc-C is an effective cervical spine disc prosthesis preserving segmental motion after surgery and providing improvement in pain and functional outcome for the patients. In order to avoid the adjacent level disease and to preserve the natural cervical motion, disc arthroplasty is favorable over fusion in most patients.

Long-term follow-up studies will be needed to determine the definitive treatment.

0-46

Outcome after Cervical Disc Prostheses. Part I: Radiological Follow-Up

M. Sonnberger[1], J. Zöhrer[2], B. Parsaei[2], T. Narovec[2], A. Grimmer[2], G. Wurm[2]
[1]Institute for Neuroradiology and Neurosurgery; [2]Center of Neuroscience Wagner-Jauregg Linz, Austria

Introduction Anterior discectomy and fusion are established surgical procedures in case of cervical degenerative disc disease (DDD). Fusion of a segment, however, may lead to increased forces at the levels above and below the operated segment resulting in adjacent segment degeneration. An alternative to fusion procedures is a cervical disc prosthesis with the aim of restoring normal spinal motion and potentially reducing adjacent segment degeneration. In a retrospective study, the radiologic results before and after cervical arthroplasty were evaluated in our hospital. They serve as basis for long-term outcome.

Methods A consecutive series of 177 patients who underwent arthroplasty between April 2002 and January 2007 for treatment of cervical DDD causing radiculopathy and/or symptomatic myelopathy were included. We used the Bryan disc prosthesis in 136 patients, and Prestige disc prosthesis in 42 patients. Single-level operation was done in 130 (73.45 %), multilevel procedures (up to 4 levels) in 47 (26.55 %) patients. Overall, 169 Bryan and 58 Prestige prostheses were placed.

Lateral neutral, extension, flexion and dynamic cervical radiographs were obtained before and 6–69 months after surgery (mean 34 months). Motion of the operated level, of the adjacent segments and overall motion between C2–C7 were compared. The range of motion was defined as the difference of the angle between full extension and flexion.

Results At the operated segment and at the whole cervical spine (C2–C7), the range of motion increased significantly in mid-term follow-up after surgery, without significant difference in the use of the Bryan or Prestige disc prosthesis. No motion, defined as < 2 degrees, was observed in 6 cases (13.6 %) with Prestige and in 22 cases (21.15 %) with Bryan prostheses. 10 patients with Bryan disc developed ventral spondylosis. After surgery, 10 patients (7.3 %) with a Bryan prosthesis showed kyphotic cervical alignment. Translation and the occurrence of osteophytes at the adjacent levels did not change significantly following surgery.

Conclusion Cervical arthroplasty significantly increased functional motion at the level of the procedure and at the cervical spine between C2 and C7 in mid-term follow-up. More patients with Bryan than Prestige prostheses seem to develop postoperative kyphosis, and more Bryan prostheses seem to loose motion with time, however, follow-up of Prestige discs is shorter than of Bryan discs. Radiological follow-up and the correlation of the clinical effect and radiological outcome are necessary to prove the maintenance of functional spinal motion and to select patients who will benefit most of cervical disc prostheses. Further radiological examinations of our patients are scheduled to determine long-term outcome.

0-47

Outcome after Cervical Disk Prostheses. Part II: Clinical Follow-Up

G. Wurm[1], J. Zöhrer[1], B. Parsaei[1], T. Narovec[1], A. Grimmer[1], M. Sonnberger[2]
[1]Departments of Neurosurgery and [2]Neuroradiology, Landesnervenklinik Linz, Austria

Objective Traditionally, a procedure called anterior cervical discectomy with fusion (ACDF) has been the "gold standard" for surgically treating degenerative disc disease (DDD) in the cervical spine. Using bone grafts and instrumentation such as metal plates and screws, this procedure fuses two or more adjacent vertebrae, ideally stabilizing the segment and providing relief. This is a highly successful operation, however, a potential disadvantage associated with spinal fusion is the loss of motion and flexibility in the treated vertebral segment. Artificial disc replacement offers patients with DDD in the cervical spine an alternative to fusion surgery. Various disc prostheses have been designed to replace a diseased or damaged disc to maintain motion. They are thought to allow the following motions of a natural intervertebral disc: flexion, extension, side bending and rotation. The theoretical advantages are to reduce the incidence of adjacent segment degeneration while maintaining normal neck motion.

Patients and Methods 177 patients (91 m, 86 f; age between 22–77 years, mean 44) received between April 2002 and January 2007 either Bryan (n = 136) or Prestige (n = 41) disc prostheses in our hospital. 131 patients (74.01 %) had radicular symptoms and 50 (28.25 %) had symptomatic myelopathy. Predominant pain was in the arm in 98 patients (64.90 %), and in the neck in 53 patients (35.10 %). The cervical disc prostheses were indicated for use in the C3–C7 levels of the cervical spine. Single-level operation was done in 130 (73.45 %), multilevel procedures (up to 4 levels) in 47 (26.55 %) patients.

Results Follow-up was performed 6–69 months after operation (mean 34 months). Radicular arm pain had disappeared in 79 (71.20 %), and was improved in 30 patients (27.00 %). Neck pain had disappeared in only 37 (32.50 %), and was improved in 69 (60.50 %). Weakness had disappeared in 65 (76.50 %), and was improved in 18 (21.10 %). Myelopathic symptoms had disappeared in 22 (46.90 %), and were improved in 18 (38.30 %). Complications needing re-operation were observed in 4 patients (1 epidural bleeding, 1 fusion operation, 2 adjacent level operations). Difficulties in swallowing were still present in 13 patients, 3 (7.3 %) in Prestige and 10 (7.4 %) in Bryan disc prostheses. Hoarseness was still reported by 2 patients (one each; 2.4 % and 0.7 %). Patients experienced no implant failures or migrations. Neck complaints reported by Visual Analogue Scale (0–100) diminished from 63 to 24 (mean values). Arm complaints reported by Visual Analogue Scale diminished from 66 to 18 (mean values). The Neck Disability Index (Oswestry) showed similar results. There were no significant differences concerning pain outcome between the two types of prostheses. However, patients whose predominant pain had been in the arm preoperatively improved more than those with neck pain. 146 patients (93.59 %) judged the operation to be a success; 149 (95.50 %) would like to undergo the same procedure again if necessary.

Conclusion While early clinical results are encouraging, the true test comes when long-term follow-up data is available. Long-term follow-up is needed to determine if indeed the theoretical advantages are better than traditional fusion. Our preliminary results suggest that patients whose predominant preoperative pain had been in the arm improved more than in those with neck pain.

0-48

Open-Door Expansile Cervical Laminoplasty Using Titanium Miniplates: Early Clinical Experiences

J. Burtscher, A. Beres, H. Gritsch
Neurosurgical Department, Wiener Neustadt, Austria

Introduction The authors report early clinical experiences using a special technique for cervical open-door laminoplasty in patients with cervical spondylotic myelopathy (CSM).

Methods Between June 2007 and April 2008 14 patients with cervical myelopathy secondary to multilevel cervical spondylosis and spinal stenosis were treated with an expansile open-door laminoplasty technique using titanium miniplates to stabilize the posterior elements as described by O'Brien [1]. Mean follow-up time: 6.7 months. Mean patient age: 64 years. Total levels of cervical laminoplasty performed: 48. Neurological outcome was evaluated using the Modified Japanese Orthopedic Association functional score [2]. Assessment of CSM was performed before and after surgery as well as 3 and 6 months postoperatively. Two patient groups were treated. Group 1 (11 patients) with CSM but without clinical and/or radiological signs of instability, normal cervical lordosis and/or relatively straight cervical spine but without kyphosis. Group 2 (3 patients) were treated using a combined approach with the open-door laminoplasty technique prior to anterior interspace decompression and fusion performed in a second step.

Results During follow-up none of the titanium miniplate constructs failed out of 48 levels in 14 patients. In all patients, different levels of clinical improvement were demonstrated ranging between 1 score point (minimum) and 5 score points (maximum). Average improvement: 2.2 score points/patient. No patient recovered fully. Two patients suffered from aggravated neck pain after open-door laminoplasty. In group 1, no signs of clinical and/or radiological instability occurred postoperatively.

Conclusion The use of titanium miniplates to stabilize the posterior elements after open-door laminoplasty proved in our institution to be an effective surgical technique in patients with CSM.

References

1. O'Brien MF, Peterson D, Casey AT, Crockard HA. A novel technique for laminoplasty augmentation of spinal canal area using titanium miniplate stabilization. A computerized morphometric analysis. Spine 1996; 21: 474–84.
2. Benzel EC, Lancon J, Kesterson L, Hadden T. Cervical laminectomy and dentate ligament section for cervical spondylotic myelopathy. J Spinal Disord 1991; 4: 286–95.

0-49

Progredient Course of Spinal Cord Tumors

G. I. Okladnikov, K. I. Kharitonova
Neurosurgery Clinic of Novosibirsk Research Institute of Traumatology and Orthopaedics, Novosibirsk, Russia

Introduction Spinal cord tumors present a significant diagnostic challenge and have a specific clinical course.

Methods A review of 300 patients with spinal cord tumors of different localization and histological structure is presented. Diagnosis was verified using conventional and advanced methods, as well as evidence of surgical intervention and a histological study of tumors.

Results Analysis of clinical observation and neurological symptom dynamics allowed us to identify two main variances of spinal cord tumor onset and course – progredient and remittent ones.

Progredient course of the spinal cord tumor was observed in 78 % of patients, being either slow or fast. A slow-progressive course of spinal cord tumor was observed over some years (average 30 months) since the appearance of first symptoms until the accurate clinical diagnosis. The neurological picture in this group of patients was characterized by augmenting of pain syndrome, motor and sensitive impairments depending on the spinal cord compression stage. Since each compression stage (root, half-breadth, or full-breadth compression) had its own specific features, it was especially difficult to assess the disease onset and dynamics.

The slow-progressive course of benign, particularly extramedullar tumors was in some cases characterized by acceleration of the course and neurological symptom development, evidently due to the occurrence of compressive ischemic or compressive hemorrhagic disorders. In case of slowly growing neurinoma, especially mobile subdural ones, this acceleration is determined by the tumor dislocation to spinal blood vessels. Spinal cord meningiomas located in the crucial area of vascularization were often accompanied by acceleration of the disease course. Extramedullar primary malignant meningiomas and neuronomas were characterized by a fast augmentation of the clinical picture (average duration 4–5 months). Such course of the disease was also provoked by physiotherapeutic procedures for spine trauma, and the toxic effect of the tumor on spinal vessels.

Conclusion Progredient course of the spinal cord tumor is quite common, but it can be slow or fast. Acceleration of the disease course and neurological symptom dynamics can be related to the malignation of the tumor, as well as to the negative effect of exogenous and endogenous factors. The proper assessment of clinical course variances allows to understand the pathogenesis of clinical syndromes and to improve diagnosis of spinal cord tumors, especially at early stages.

Session VI: Around the Sella

0-50

Prognostic Value of MIB-1 Labeling Index in Residual Non-Functioning Pituitary Adenomas for Tumor Progression

S. Wolfsberger[1], G. Widhalm[1,2], M. Preusser[2], I. Fischer[2], A. Wöhrer[2], J. Wunderer[1], J. A. Hainfellner[2], E. Knosp[1]
[1]Department of Neurosurgery and [1]Institute of Neurology, Medical University Vienna, Austria

Introduction In residual non-functioning adenomas, reliable prognostic parameters indicating tumor progression are warranted. Ki-67 expression/MIB-1 labeling index (LI) is considered a promising candidate factor. The aim of the present study was to analyze the clinical usefulness of MIB-1 LI for prognosis of tumor progression.

Methods We studied a cohort of 92 patients with non-functioning adenomas that were treated at our department. Based on postoperative MRI, patients were considered either to harbor a residual tumor (n = 41) or as tumor-free (n = 51). The residual tumor group was further subdivided in subgroups with stable residual tumors (n = 14) or progressive residual tumors (n = 27). MIB-1 LI was assessed in tumor specimens of all patients, and statistical comparisons of MIB-1 LI of the various tumor subgroups were performed.

Results We found no significant difference of MIB-1 LI in the residual tumor group as compared to the tumor-free group. However, MIB-1 LI ($p = 0.038$) was significantly higher in the progressive residual tumor group, as compared to the stable residual tumor group. In addition, time period to second operation was significantly shorter in residual adenomas showing a MIB-1 LI > 3 % (log rank $p < 0.001$).

Conclusion Our data indicate that MIB-1 LI in non-functioning pituitary adenomas is a clinically useful prognostic parameter for progression of postoperative tumor remnants. MIB-1 LI may be helpful in decisions of postoperative patient management (e.g., radiographic intervals, planning for re-operation/radiotherapy/radiosurgery).

0-51

Empty Sella Syndrome

D. Bludovsky[1], M. Choc[1], J. Kastner[2], K. Janouskova[3]
[1]Department of Neurosurgery; [2]Radiodiagnostic Clinics; [3]Clinic of Ophthalmology, Charles University Hospital in Plzen, Czech Republic

Introduction An empty sella was for the first time described by Bush in 1951 as an anatomical autopsy finding. The term empty sella syndrome (ESS) has been used since a Colby and Kearns publication in 1962. This division lasts till today – an asymptomatic empty sella and symptomatic ESS. Empty sella syndrome is usually described in case reports as a rare event and there is no study concerning treatment of such a situation. Is it rare or (being mostly asymptomatic) just under-diagnosed? Maybe anatomical predispositions play a role

in developing primary empty sella. The etiology is clearer only in postoperative changes (e.g. after pituitary adenoma surgery).

Methods There are two basic options – conservative or surgical treatment. We present ten patients – six women and four men, five of them with primary and five with secondary ESS. Five patients had surgery for ESS.

Results The best surgical result is to stop visual deterioration. We reached this result with surgery without morbidity and mortality in every patient in our small group.

Conclusion ESS is a rare syndrome, but some patients may profit from operative treatment. We will present some pathophysiological theses and our experience with a very small group of patients treated in our department from 1991 until today.

O-52

Conservative and Invasive Approach to Transsphenoidal Surgery Complications

J. Náhlovský[1], I. Látr[1], A. Krajina[2], T. Česák[1], S. Řehák[1]
[1]Department of Neurosurgery; [2]Department of Radiology – Teaching Hospital, Faculty of Medicine, Charles University Hradec Králové, Czech Republic

Complications in the transphenoidal approach are rare events but they cannot be eliminated completely. The surgeon must recognize that a complication has arisen and has to be prepared to prevent further negative development and adverse influence on the postoperative course. Among more serious complications are arterial bleedings necessitating in some cases intravascular intervention. Visual impairment can be exceptionally connected with ischemic necrosis and edema of the residual tumor. This situation requires reoperation. Postoperative rhinorrhea was treated in our series conservatively since 1989 only as a preoperative CSF leak is searched for and sealed carefully.

A retrospective study of our patients was made to evaluate the incidences of death, important (vascular injury, meningitis, visual impairment and conditions requiring surgical revision) and less important (diabetes insipidus, new hormonal deficit, pre- and postoperative rhinorrhea) complications.

In the group of 578 patients operated between 1974 and 2007 was one case of vascular injury to the carotid artery treated (in 1987) by balloon occlusion. Diagnostic tools and surgical techniques have substantially changed since 1987. An injury to the cavernous sinus and to arterial structures can nowadays be prevented by maintaining constant orientation within the operative field which is much easier with the help of precise preoperative information (MR), use of neuronavigation in some cases and endoscopic or endoscopically assisted interventions.

INV-05

Craniopharyngiomas – How Radical Should the Surgeon Be?

J. Šteňo, I. Bízik, V. Matejčík
Department of Neurosurgery, Comenius University Medical School, Bratislava, Slovakia

Objective Radical tumor removal is the most efficient mode of treatment of craniopharyngiomas which, however, may cause severe morbidity and mortality. The aim of the study was to find the factors influencing surgical outcome.

Materials and Methods Analysis of the results of comparison of surgical outcome in 100 patients consecutively operated from 1991–2007 with preoperative neuroradiological and operative findings and the results of a morphological study (30 cases) performed in the past.

Results There was no mortality in infradiaphragmatic, i. e. in intrasellar (4 patients) and intrasellar and suprasellar (36 patients) craniopharyngiomas including large and giant ones (80 % radically removed, in primary surgery 90 %). After surgery of supradiaphragmatic tumors (75 % radically removed) 7.6 % died. Also morbidity was higher in the supradiaphragmatic group. Acute hypothalamic insufficiency occurred only in this group, other disturbances (visual functions worsening, permanent diabetes insipidus, hypopituitarism) in both groups. In most cases, it could not be explained solely by surgical manipulation of the nervous structures. The assumption of another cause, the disturbance of blood supply of visual and hypothalamic structures is supported by the results of morphological studies of relationships of the tumors with perforating branches of internal carotid and posterior communicating arteries, with pia mater covering the floor of the third ventricle, and with nervous structures of the hypothalamus.

Conclusion Care should be taken not only to choose the surgical approach avoiding the hypothalamic structures and surgical techniques minimizing potential surgical damage but also to preserve the perforators and the vascular network of the pia mater.

O-53

Extended Endoscopic Transnasal Transsphenoidal Approach for Non-Adenomatous Lesions

V. Gellner[1], S. Kurschel-Lackner[1], E. M. Holl[1], G. Clarici[1], H. Braun[2], H. Stammberger[2], M. Mokry[2]
Departments of [1]Neurosurgery and [2]ORL Head & Neck Surgery, Medical University, Graz, Austria

Purpose To evaluate the surgical results of expanded endoscopic endonasal transsphenoidal approaches for intra- and extrasellar non-adenomatous lesions.

Methods From 2004–2008, 40 patients with intra- and/or extrasellar non-adenomatous lesions were treated in 51 endoscopic transsphenoidal procedures. The mean age was 41.3 years (range 4–72), 52 % were female. Visual field deficiency was present in 13 patients, amaurosis in one.

Results Mean follow-up was 21.3 months (range 1–47); one patient was lost to follow-up. Histological diagnosis disclosed Rathke's cleft cysts in 9 patients, meningioma in 7, craniopharyngioma in 5, carcinoma and chordoma in 3, lymphocytic hypophysitis and schwannoma in 2, granulomatous hypophysitis, cholesterol cyst, fibrous dysplasia, fibrillary astrocytoma II, pilocytic astrocytoma, neuroblastoma, osteoblastoma, PNET, plasma cell myeloma and a metastasis each in 1. Total removal could be achieved in 18 cases, subtotal removal in 4, partial removal in 9, biopsy in 3 patients, cyst evacuation in 6 and optic nerve decompression was the aim of surgery in 2 patients. Postoperative transient complications comprising cerebrospinal fluid rhinorrhea in 5 patients (12.5 %) and transient diabetes insipidus (DI) occurred in 5 % (n = 2). Further treatment consisted of 3 endoscopic reoperations and 2 craniotomies due to residual or recurrent tumors, CSF rhinorrhea and optic nerve compression, respectively.

Conclusions The extended endoscopic transsphenoidal approach has been shown to be applicable for a wide variety of intra- and extrasellar lesions. The procedure is minimally invasive and can also be easily performed with satisfying results in non-adenomatous lesions. Complications related to surgery are in general transient and can therefore be classified as minor.

O-54

Long-Term Results and Late Complications Following Intracavitary Yttrium-90 Colloid Irradiation of Recurrent Cystic Craniopharyngiomas

J. Julow[1,2], E. O. Backlund[3], F. Lányi[4], M. Hajda[4], K. Bálint[4], I. Nyáry[2,4], G. T. Szeifert[2,4], Á. Viola[1], Z. Kolumbán[2]
[1]Department of Neurosurgery, St. John's Hospital Budapest, Diósárok; [2]Semmelweis Medical School, Budapest; [3]Department of Neurosurgery, University Hospital, Linköping, Sweden; [4]National Institute of Neurosurgery, Budapest, Hungary

Objective Data were analyzed to assess the value of stereotactically applied intracystic colloidal Yttrium-90 (YTx) for the treat-

ment of recurrent cystic craniopharyngiomas covering a 30-year period.

Method This paper compares data from 103 YTx procedures in 71 patients between 1975 and 2008. The cumulative beta dose aimed at the inner surface of the cyst wall was 300 Gy.

Results Following YTx, initial cyst volumes decreased by an average 79 %. In 47, the reduction was > 80 %, and of these in 27 the cyst disappeared totally within one year.

The time course of volume reduction could be expressed mathematically by the formula of $0.73 \times e^{-0.62 \times T} + 0.27$, where „e" is the basic number of natural logarithm and „T" is the time expressed in months.

For the Kaplan-Meier analysis, we defined the end point as a patient's death. Median survival was 14 yrs for 69 surgically removed and non-recurrent tumor patients, while median survival after 70 YTx was 7 years.

Late complications of YTx were related to the anatomical localization of the cyst, that is intrasellar, presellar, intraventricular and retrosellar. The intrasellar localization caused hormonal signs in more than 60 %. The presellar (prechiasmatic/suprasellar) localization caused neuro-ophthalmological complications in 5.8 % and internal carotid artery injury in 1.6 %. The intraventricular caused hypothalamic lesion in 1.6 %. Treatment of retrosellar (retrochiasmatic, suprasellar) tumors occasionally induced hypothalamic and/or pontomesencephalo-thalamic damage, obviously by untoward radiation to the so-called perforating arteries. This occurred in 3.2 % of these latter cases.

Conclusion The long-term results support the view that intracavitary ^{90}Y-irradiation is a non-invasive and effective method for treatment of craniopharyngioma cysts. Because the mean pathway of beta irradiation is 3.6 mm in the soft tissues (maximum 11 mm) it cannot influence the solid part of the tumor; therefore, the best result can be expected in solitary cysts and the solid part of the tumor can be treated by radiosurgery.

0-55

Colloid Cysts of the Third Ventricle: Endoscopic vs Microsurgical Approach

K. Stachura, W. Libionka, M. Moskała
Department of Neurosurgery and Neurotraumatology, Jagiellonian University School of Medicine, Krakow, Poland

Introduction Endoscopic approach to colloid cysts of the third ventricle is currently receiving increasing interest. However, effectiveness of this mode of treatment is a matter of discussion. The aim of the authors is to present direct and long-term outcome after endoscopic treatment of colloid cysts in comparison with results achieved with the use of open microsurgical approach.

Methods Medical records of 23 patients with colloid cysts treated at the authors' institution between 1995 and 2006 were retrospectively analyzed. 10 patients were operated on endoscopically and in the remaining 13 patients, a transcortical transventricular microsurgical approach was used. Distributions of sex and age of the patients were comparable in both groups. Clinically, the majority of patients presented with symptoms of increased intracranial pressure. All patients had internal hydrocephalus. Diameter of the operated tumors ranged from 1.5–3.0 cm. Mean long-term follow-up period was 31 months.

Results In 6 of 10 endoscopically treated patients with colloid cysts, tumors were completely removed. In 3 patients, small parts of the capsule were left that were strongly adherent to the choroid plexus and veins. In one case, a bigger portion of the capsule was left, that was partially obstructing the interventricular foramen. This portion was finally removed microsurgically. During the direct postoperative course 2 patients complained of memory deficits, which became permanent in one case. One patient developed temporary mutism. In one case, with symptoms of hydrocephalus without colloid cyst recurrence, a ventriculo-peritoneal shunt was implanted.

In the microsurgically treated group, colloid cysts were completely removed in all patients. One patient was reoperated because of intracerebral hematoma. During the postoperative course, 2 patients suffered from temporary hemiparesis and 2 patients developed epilepsy. Within one year after surgery 3 patients were shunted because of hydrocephalus.

Conclusion Endoscopic approach to colloid cysts of the third ventricle is safe, effective and carries a lower complication rate when compared to a microsurgical approach. Endoscopy may be recommended as a treatment of choice in the majority of patients with colloid cysts, although in selected cases the microsurgical approach is still mandatory.

Session VII: Free Topics

0-56

Modern Teleconference Techniques for Neurosurgical Education

Z. Novák, I. Řehák, Dušek, D. Schwarz, J. Chrastina, R. Jančálek, P. Cejpek
Department of Neurosurgery FH St. Ann and MF MU in Brno, IBA MF MU Brno, Czech Republic

Introduction Pregraduate education of medical students and postgraduate training are important parts of work of a neurosurgical department. The concept of OR and teaching rooms at the Neurosurgical Department MF MU and FH St. Ann, Brno, followed the direct communication between teachers and students, however the spatial limits of operating rooms together with safety requirements limits the presence of students and residents in the OR. The surgeon also has to follow numerous data sources together with the process of education. Moreover, minimal movement of persons in the OR is known to improve surgical outcome especially regarding infectious complications.

Methods The teaching room is connected to the OR by means of two teleconference systems, Polycom ViewStation VSX 7000 with Standard H.323 for LAN data transmission. This videoconference system works in PAL and NTSC (data transfer speed 56 kbps to 2 Mbps). Standard H.320 is employed for data transmission on lines with lower permeability (ISDN). Patent technology for fully bidirectional sound transmission with echo and noise suppression supports the process of data transfer.

Results The surgical situation is presented by the teacher in the teleconference room and questions may be answered by the teacher or directly by the operating surgeon. Data from the surgical microscope, endoscope or neuronavigation system can be transmitted to the teaching room. With the help of this sophisticated technique it is not difficult to combine the process of education with direct transmission from the operating room. Therefore, students can easily observe the key point of surgery from patient positioning, craniotomy approach and intracranial surgery as recorded by the neuroendoscope or surgical microscope together with the results of intraoperative neuromonitoring.

Conclusion Both pregraduate education and postgraduate training are equally unavoidable tasks of a neurosurgical department utilizing its specific possibilities and features. Teaching files on CD are being prepared with the adequate theoretical background but also presenting the key surgical steps of surgical interventions. The teleconference system is connected to the metropolitan network, therefore distant transmission of image, surgical workflow and sound is feasible. The importance of neurosurgery in the content of pregraduate and postgraduate education especially in the field of neurosciences facilitates the need for education quality.

0-57

Brainstem Cavernomas: Preoperative Imaging and Surgical Management

M. Tatagiba, G. C. Feigl, M. Moraes, M. Acioly
Department for Neurosurgery, University Hospital Tübingen, Germany

Objective Brainstem cavernomas are benign vascular malformations, however, they can cause severe neurological deficits when bleeding. Removal of these brainstem lesions is frequently related with a high surgical morbidity and there is no general consent on the surgical management of these lesions. It was the goal of this study to review our surgical results achieved with our strategy of using MRI-based tractography for preoperative planning and intraoperative brainstem mapping to optimize resection via approaches tailored to the location of the lesion in the brainstem.

Methods A total of 18 consecutive patients with cavernomas in the brainstem were included in this study. All treated patients suffered at least one bleeding before they underwent surgical treatment. Presenting symptoms included headache, facial palsy, diplopia, dizziness and gait disturbance. Preoperative neuroradiological examinations included MRI with diffusion tensor imaging (DTI) to visualize brainstem tracts.

Results Tailored approaches to the locations of the lesions included the pterional, medial and lateral supracerebellar, retrosigmoid and the medial suboccipital approach. Navigation and brainstem mapping were used to plan and determine a safe point of entry. Microsurgical resections of cavernomas were performed under continuous intraoperative monitoring. Total tumor removal was achieved in 17 cases and new permanent cranial nerve deficits were observed in only two patients after surgery.

Conclusion Our results show that by using a refined microsurgical technique combined with approaches tailored to the location of the lesion, continuous neurophysiological monitoring and brainstem mapping, a total resection of brainstem cavernomas can be achieved with a very low surgical morbidity.

0-58

Surgical Treatment of 27 Cases of Brain Stem Cavernous Malformations

P. Haninec, E. Zvěřina, L. Houšeťava, R. Tomáš, M. Orlick
Department of Neurosurgery, 3rd Faculty of Medicine, Charles University, Hospital Vinohrady, Prague, Czech Republic

Recent technological advances and exact anatomy of the posterior fossa allow to operate brain stem cavernous malformations. In our series, 27 patients had been treated by radical surgery since 1991 with low morbidity and mortality of 5 %. We consider the resection of brain stem cavernous malformation according to their location (near the surface), mass effect of hemorrhage and progressive neurological deficit due to the repeated hemorrhage. The preoperative neurological finding has a strong impact on postoperative functional outcome. Thus, in cases with no or little neurological findings and with cavernous malformations located near the pial or ependymal surface it is advisable to operate soon.

0-59

Long-Term Seizure Outcome in Patients with Radiosurgically Treated Arteriovenous Malformations

S. Grossauer, S. Kurschel, H. Eder, K. Leber
Department of Neurosurgery, Medical University Graz, Austria

Objective Long-term seizure outcome of patients with radiosurgically treated arteriovenous malformations was assessed.

Methods Between 1992 and 2007, 196 patients underwent AVM radiosurgery. 52 of these patients (27 %) had a history of single or recurrent seizures and at least 1-year follow-up.

Follow-up ranged from 12–138 months (median 59 months). Sex, age, AVM size, AVM location, intracranial hemorrhage, AVM obliteration, seizure type, duration of seizure history and seizure outcome were studied in patients with epileptogenic AVM.

Results As determined with the Engel Seizure Outcome Scale there were 32 (61 %) Class-I (free of disabling seizures), 7 (14 %) Class-II (rare disabling seizures), 6 (12 %) Class-III (worthwhile improvement) and 7 (14 %) Class-IV (no worthwhile improvement) outcomes.

Delayed cyst formation required microsurgical cyst resection in 2 patients (4 %) with Class-IV outcome; these 2 patient improved to Class I after microsurgery.

1 patient (2 %) with Class-IV outcome underwent microsurgical AVM and epileptogenic focus resection with postoperative improvement to Class I.

Conclusion Radiosurgical treatment of patients with epiletogenic AVM leads to excellent long-term seizure control in most patients.

Some patients with poor postradiosurgical seizure outcome require microsurgical treatment.

0-60

Asymptomatic Carotid Surgery in South Bohemia in Local Anesthesia – Institutional Experience

D. Sokol, J. Fiedler, V. Chlouba, M. Bombic, V. Pribán
Neurosurgery, Hospital Ceské Budějovice a.s., Czech Republic

Introduction Results of ACAS and ACST confirmed that CEA reduces the risk of stroke from 12 to 6 % in 5 years for patients with asymptomatic carotid stenoses ≥ 60 %. The question remains what kind of anesthesia is most suitable: general or local anesthesia. Due to very low absolute stroke risk reduction, just 1 % per year in asymptomatic carotid stenosis, it is imperative to achieve MM < 3 % and, therefore, even small MM reduction because of appropriate anesthesia may add to greater effect of operation.

Our objective is to evaluate 30+day morbidity and mortality (MM) of asymptomatic carotid operations in local anesthesia performed in our department from 1998–2007 and to analyze the subgroups of patients in the same manner. We also assess TIA events, surgical complications and analyze subgroups according gender, age, carotid stenosis, Sundt scale, symptomatic contra lateral carotid stenosis and shunt use.

Patient Population and Methods 387 patients with ≥ 60 % ACS were operated on from 1998–2007. The average age was 67.3 years, average carotid stenosis was 81.8 %. Diagnosis of stenosis was made by USG and conventional angiography, all patients had CT or MRI brain scan. Anesthesia was performed by deep cervical plexus block technique. All patients had antiaggregation therapy. Patients were followed clinically and by ultrasound one month after operation and then in 6-month intervals.

Results Perioperative strokes were noted in 5 patients. There were 2 myocardial infarctions, one of them resulted in death within 30 days. Total morbidity and mortality in the perioperative period amounted to 1.8 %. Early transient ischemic attack (TIA) was noted during operation in 4 patients, late TIA occurred in 2 patients. We did not find statistically significant difference in MM in our subgroups except in the group with shunt use, however reliability of statistics is questionable due to the small number and circumstances of MM. More details will be presented at the conference.

Conclusion In our institution, use of local anesthesia did not cause unacceptably high MM. Our MM (1.8 %) can be considered adequate and according to published data should ensure benefit of CEA for our patients. MM risk in subgroups does not differ except in the subgroup of shunt use, however we do not consider the results of higher MM risk in this subgroup valid.

0-61

Enhancing Visualisation in Neuroendoscopic Surgery

Z. Novák, I. Xíha, J. Chrastina
Department of Neurosurgery FH St. Anns and MF MU in Brno, Czech Republic

Introduction In the beginning of neuroendoscopy, there was only one possibility of surgical field visual control – to directly look into the endoscope tubing with insufficient illumination. Great progress was made in the early 1950s and was driven by the discoveries of the British physicist Harold Hopkins. His results were of immense importance for endoscopic neurosurgery. The attempts to eliminate the necessity of directly looking into the neuroendoscope were first noticed in the work of Forestier and Vulmier (1954). Guiot used fiber optic for a transphenoidal approach and reported a biportal technique with a separately introduced endoscope and another surgical instrument in 1963. Revolutionary changes occurred in the early 1980s. In this time period, small CCD cameras that could be attached to the endoscope replaced the previous Vidicon systems.

Method Our department is equipped with an endoscopic chain FULL HD Aesculap B Braun. The 3 CCD PV 440 camera consists of a camera head with the endoscope fixation system and cam coding system with all available inputs, both HD and SD. All systems work in NTCS norm and the highest quality can be reached by means of the interface DVI-D, furthermore on HD SDI or RGB inputs can be the visual data flow resembling 1080i or 720p and on the connector system S video or composite input converted analog signal NTCS 480 i. The viewing monitor XD CAM Medical Video Recorder SONY marked PDW 75 MD with the possibility of 4.5 hours of data storage HD TV stream (BLUE RAY disc). This recording system can store HD TV MPEG 2 stream in three qualities reflecting the flow of data (18 Mb/s VBR [LP], 25 MB/s CBR [SP] and 35 MB/s [HQ]).

Results Surgical videos illustrating the advantageous features of the individual camera and endoscopic systems will be presented.

Conclusion Single-chip and three-chip cameras are generally manufactured for conventional systems. For single-chip cameras in professional systems equipped with an 800,000 point chip (less expensive 500,000 points) all the receivers for RGB colors – red, green and blue – are located on the chip and the rate of individual color intensities forms the final color. Filters separating the individual spectral components utilizing various technologies were constructed for these receivers. On the other hand, three-chip cameras are equipped with three chips, with a filter located in front of each separating the individual spectral components and the light reaches the chips through a system of small mirrors with a reflecting and semipermeable surface. The FULL HD system contains only a three-chip system, with each chip containing 800,000 points (less expensive systems 560,000 points – the final resolution is achieved by means of mathematical interpolation from the surrounding points). The improvements in surgical field visual control aid greatly to the safety of not only neuroendoscopic surgeries.

0-62

Neuroendoscopic Treatment of a Posterior Fossa Arachnoid Cyst

Z. Novák, J. Chrastina, V. Feitová, I. Xíha
Department of Neurosurgery and Department of Imaging Techniques, FH St. Anns and MF MU in Brno, Czech Republic

Introduction The incidence of infratentorial arachnoid cysts is substantially lower than of middle fossa arachnoid cysts and this holds true even more in the series of patients treated by means of neuroendoscopic surgery. The aim of our study is to present our experience with neuroendoscopic treatment of posterior fossa arachnoid cysts.

Methods The group of patients consisted of 13 males (12–55 years old) and 4 females (18–50 years). Clinical symptoms depended on the size of the cyst and location and were related to cranial nerves, brainstem and cerebellar compression or intracranial hypertension. 3 patients were referred after previous shunt surgery (cystoperitoneal shunts, in one patient combined with ventriculoperitoneal shunting). Direct neuroendoscopic cyst fenestration into the cisternal system was performed in 8 patients as primary surgery, in 2 patients as secondary surgery after previous cystoperitoneal shunting. Endoscopic third ventriculostomy was the only procedure in two patients and was combined with direct intervention on the cyst in one patient in two-staged surgery. Endoscope-assisted craniotomy was the surgical choice in 3 patients with the cyst considered to be difficult for neuroendoscopic fenestration.

Results In no case had neuroendoscopic surgery to be converted into open microsurgery due to uncontrollable bleeding or surgical complication. The decision to remove intracystic catheters was always considered individually. Our philosophy is to start surgery with endoscopic cyst inspection and if neuroendoscopic surgery fails, the approach can be easily adapted for microsurgical cyst fenestration. The aim of surgery is to relieve symptoms related to focal cyst expansion with surrounding neural structure compression, restoration of cerebrospinal fluid pathway patency, and restoring of cerebrospinal fluid flow at the level of the foramen magnum.

Conclusion Literature data shows safety and efficacy of neuroendoscopic surgery of posterior fossa cysts, with the efficiency reaching more than 90 %. The result of neuroendoscopic surgery depends on cyst size and patient age, with the outcome being better in younger patients and meticulous correlation of clinical symptoms. Endoscopy is considered to be particularly useful for the inspection of deep cyst portions in ambient and prepontine cisterns. Neuroendoscopy is also particularly useful for correct placement of the intracystic catheter. In cases of combined malformations the final outcome is determined by the underlying cause.

0-63

Piezoelectric Optic Nerve Decompression in Skull Base Tumors

G. Widhalm[1], M. Kotter[1], H. Widhalm[1], R. Sayegh[2], W. Hauff[2], E. Knosp[1], C. Matula[1]
Departments of [1]Neurosurgery and [2]Ophthalmology, Medical University Vienna, Austria

Introduction Decompression of optic nerves represents a standard procedure in the neurosurgical treatment of skull base tumors. However, standard high-speed drills are associated with an increased risk of mechanical and thermal injury to the optic nerves. Piezosurgical bone removal, a technique based on ultrasonic microvibrations, holds the promise of significantly reducing the risk and at the same time increasing the accuracy of the procedure. The aim of our study was to prospectively evaluate the clinical usability and the postoperative visual outcome of patients treated by piezoelectric optic nerve decompression.

Methods Between 6/2006 and 6/2008 a cohort of 10 patients with skull base tumors with clinical and radiological signs of optic nerve compression were operated using the piezoelectric device at our department. In all patients additionally to the resection a bony decompression of the affected optic nerve(s) was performed. Visual acuity and visual field were examined as the primary functional outcome parameters of the surgical treatment of these tumors immediately before and after neurosurgical procedure (6 days to 6 months postoperatively).

Results In 9/10 patients, a gross total resection could be achieved, in 1/10 patients a subtotal resection was performed. In 8/10 patients only one optic nerve was affected and decompressed, in the remaining two patients both affected optic nerves were decompressed. Histological examination revealed a meningioma in 8/10 patients, a neurinoma in 1/10 patients and an esthesioneuroblastoma in 1/10 cases. Postoperative visual acuity and visual field examination compared to preoperative analysis improved in 8/10, was the same in 1/10 cases and slightly deteriorated in 1/10 patients. No perioperative mortality or visual loss was observed in our patient cohort.

Conclusion Our patient series demonstrates that piezoelectric decompression of optic nerves in skull base tumors represents a

clinically reliable and safe technique without the risk of mechanical and thermal injury to the optic nerves. Based on our data we could demonstrate the clinical usability combined with the improvement of visual function in the majority of our patients.

0-64

Thermotherapy Using Magnetic Nanoparticles: Results of a Feasibility Study on Patients with Glioblastoma Multiforme

K. Maier-Hauff[1], P. Wust[2], A. Jordan[3]
[1]Department of Neurosurgery, Bundeswehrkrankenhaus, Berlin; [2]Department of Radiotherapy, CVK, Charité University Medicine Berlin; [3]MagForce Nanotechnologies AG, Berlin, Germany

Introduction Hyperthermia offers an attractive approach for the treatment of cancer. We aimed to evaluate the feasibility and tolerability of the newly developed thermotherapy using magnetic nanoparticles (Nano-Cancer® therapy) on recurrent glioblastoma multiforme.

Methods 14 patients (2 with primary tumors and 12 recurrences) received neuro-navigationally guided intratumoral injection of a magnetic fluid containing aminosilane-coated iron oxide nanoparticles. Treatment planning was based on thin-sliced CT or MRI scans. After instillation, patients were exposed to an alternating magnetic field to induce particle heating. The required magnetic field of 100 kHz and a variable field strength of 0–18 kA/m were generated in the applicator MFH® 300F (MagForce Nanotechnologies AG, Berlin, Germany). Magnetic fluid distribution was detected by CT, which after matching to pre-operative MRI data enables the calculation of the expected heat distribution within the tumor region. Patients received 4–10 (median: 6) heat treatments (1 hour each) following instillation of 0.1–0.7 ml (median: 0.2) of magnetic fluid per ml tumor volume and single fractions (2 Gy) of a radiotherapy series of 16–70 Gy (median: 30).

Results Thermotherapy using magnetic nanoparticles was tolerated well by all patients with only minor side effects. Median maximum intratumoral temperatures of 44.6 °C (42.4–49.5 °C) were achieved. In 90 % of the tumors, temperatures of 39.3–45.5 °C were reached (median 40.5 °C). Coverage of the tumors with temperatures above 42 °C was approximately 55 %.

Conclusion Deep cranial thermotherapy using magnetic nanoparticles in combination with radiotherapy can be safely applied on glioblastoma multiforme patients. It is still too early to claim therapeutic advantages for the applied method because survival benefit or time to progression were not defined endpoints of the study. However, the ongoing phase-II trial on glioblastoma recurrences will provide an initial indication whether the new approach can improve survival and/or quality of life.

0-65

Immunophenotypic Characteristics of Rat Bone Marrow-Derived Stem Cells. Influence of Long-Term Culture

I. Sulla[1], M. Sarissky[2], V. Balik[1], I. Sulla Jr[3], L. Mirossay[2]
[1]Department of Neurosurgery, AD Centre and [2]Department of Pharmacology, P. J. Safarik University, Faculty of Medicine, Kosice; [3]Department of Anatomy, Histology and Physiology, University of Veterinary Medicine, Kosice, Slovakia

Introduction Experimental studies showed that neural stem/progenitor cell (NS/PC) transplantation can improve neurological functions following CNS damage. Of several cell types, bone marrow-derived mesenchymal stem cells (MSCs) are the most accessible, their use is not associated with ethical or immunological problems and they have a potential to differentiate to neural cell types. The aim of our study was the evaluation of the time factor (culture duration) on the immunophenotype of rat bone marrow-derived stem cells.

Methods In 6 adult male Sprague Dawley rats, weighing 480–690 g, under general inhalatory anesthesia were double-trephined both thigh bones, bone marrow was flushed out by saline with heparin and aspirated to a syringe with DMEM and heparin. MSCs were cultured in α-MEM medium supplemented with 10 % ES-FBS, 2 mM L-glutamine, 10 ng/ml rat LIF and 10 ng/ml human LIF. At passage, 4 cultures were split in 2 parts. The first continued with the same medium, whereas the second received additional human FGF-b and EGF. The immunophenotype of cells was analyzed at different cell culture time points by 3-color cytometry and the results were expressed as mean fluorescence intensities of CD45, CD90 and cyNestin.

Results After an initial 14 days (passage 0), a heterogeneous culture of adherent cells was obtained. Twenty-five percent (range 21.2–30.3 %) of cells displayed a phenotype (CD^{45-}, $CD90^{+++}$, $cyNestin^{++}$) compatible with that of NS/PCs. During subsequent culture, cells started to lose the expression of CD90 and cyNestin. The mean fluorescence intensities (MFIs) of 9320, 9356, 9336 and 9250, or 3620, 3614, 2681 and 1628 were observed for CD90 or cyNestin, respectively at passage P0, P7, P12 and P15. This loss of NS/PCs markers was even more pronounced when cells were cultured in the medium containing human FGF-β and EGF; the MFIs observed were 9552, 8772 and 6671, or 3605, 1757 and 541 for CD90, or cyNestin, respectively.

Conclusions Cultivation of rat bone marrow cells in appropriate media led to the generation of cells with a phenotype and MFIs characteristic of NS/PCs. However, this phenotype was gradually lost during medium- and/or long-term cell culture.

Acknowledgement: This work was supported by the Research and Development Agency under the contracts No APVT-20-014002, APVT-20-032504 and APVV-20-052005, as well as grants VEGA 1/3361/06 and VVGS 58/2006.

0-66

Functional Monitoring of Facial Nerve Function in Patients with Posterior Fossa Surgery

J. Kraus[1], E. Zverina[2], J. Kluh[2], T. Smilauer[2], M. Chovanec[2], J. Betka[2]
[1]Department of Child Neurology of the Second Faculty of Medicine and Teaching Hospital Motol, Prague, Czech Republic; [2]Department of Otorhinolaryngology and Head and Neck Surgery of the First Faculty of Medicine and Teaching Hospital Motol, Prague, Czech Republic

Objective In recent decades the treatment of vestibular schwannomas underwent a considerable and astonishing evolution due to progress in neuroradiology, electrophysiology, neuroanesthesia, and microsurgery. There is an ability to remove vestibular schwannoma totally and to preserve facial and cochlear nerve function. The aim of the study is to review results of a ten-year follow-up.

Methods From 1998–2008, 231 patients had a posterior fossa surgery monitoring. Vestibular schwannomas were diagnosed in 184 cases. Large-sized (Koos stage 3 or 4) vestibular schwannomas were the most frequent finding (19 % and 59 %, respectively). Small-size (Koos stage 1 or 2) vestibular schwannomas were less frequent (3 % and 18 %, respectively). Meningioma were removed in 8 patients. Complete tumor resection was achieved in all cases.

Results The diagnosis of the vestibular schwannoma was made for these main symptoms: progressive sensorineural hearing loss (82 %), tinnitus (6 %), vertigo (0.5 %). Preoperative mild facial nerve paresis was seen in 5 cases. The approaches used were in most cases the retrosigmoid or translabyrinthine approach. Split facial nerves were detected in 5/29 (7 %) consecutive cases. At the end of the procedure, facial nerve function was damaged in 7 % of cases. In some cases the facial nerve was reconstructed by a rarely used direct end-to-end intratemporal anastomosis or side-to-end hypoglossal-facial anastomosis with preserving lingual movement. Delayed facial nerve paresis was seen in one patient.

Conclusion Minimally invasive surgical procedures with perioperative monitoring help to achieve good functional results in posterior fossa surgery.

Supported by research project NPV 2B06106, NR 8889-3, MZO 00064203.

0-67

Ventriculostomy-Related Infection Risk in Patients with Silver Nanoparticle-Impregnated External Drainages

M. Donat[1], L. Krasznai[1], T. Diem[2], P. Fae[2], F. Offner[3], K. Roessler[1]
[1]Neurosurgical Department, [2]Anaesthesiological Intensive Care Unit, [3]Institute of Pathology and Microbiology, Academic Teaching Hospital, Feldkirch, Austria

Objective The cerebrospinal fluid (CSF) infection rate in neurosurgical patients with silver-impregnated external ventricular drainages for treatment of hydrocephalus was retrospectively investigated.

Methods Sixty-eight consecutive patients (mean age 53, range 5–79 yrs) had 75 radiopaque polyurethane silver nanoparticle-impregnated external ventricular drains at the intensive care unit, mainly for posthemorrhagic hydrocephalus or ICP control in traumatic brain injury. CSF samples were taken at least 3 times a week and cultures were taken in case of suspected infection. No adverse effects related to the silver impregnation was evident.

Results Mean drainage time of a single drainage was 10 days (range 1–23 days). Altogether, there were 8 patients (11.6 %) with positive cultures. One contamination without clinical infection and one surgical infection on postoperative day 1 were excluded. This resulted in a total ventriculostomy related infection rate of 8.0 %. Drainage time of proven infections was 17 days mean (9–23 days). Five out of 7 (71.4 %) infections were caused by staphylococcus species.

Conclusion Compared to the literature, the ventriculostomy-related infection rate was low in our patients, indicating a possible advantage of silver nanoparticle-impregnated ventricular catheters to prevent infection in neurosurgical patients with external drainages.

0-68

Bratislava – Forgotten Center for Surgical Treatment of Focal Epilepsy in Eastern Europe

P. Grunert
Department of Neurosurgery, Johannes Gutenberg University, Mainz, Germany

Introduction Centers for epilepsy surgery require the coincidence of a neurologist deeply interested in epilepsy and EEG who has no prejudices and reservations against surgery and a skilled neurosurgeon who is able to master successfully also unusual operative approaches depending on the EEG findings, having also the patience for long-lasting EEG recordings during surgery. These favorable circumstances existed in Bratislava in the 1950s and a team consisting of the neurologist Ciganek and the neurosurgeons Zucha and V. Grunert built up the first Eastern European center for surgery of focal epilepsy which stood in reciprocally fruitful contact with the school of Montreal around Penfield and Jasper. Despite the high standard of surgical technique and innovations, their scientific contributions fell into oblivion because most of their articles were published in Slovak language. The aim of this paper is therefore to recall these pioneers of epilepsy surgery and to set their work in relation to the scientific scene in Europe in this field at that time and to the political situation.

Methods Critical review of the publications of this group including the Slovak papers. Interview with V. Grunert on their activities on epilepsy surgery. Recent investigations and photographic documentations in Bratislava by the author.

Results Between 1955 and 1966, over 60 patients were operated under conditions of epilepsy surgery. Depending on clinical requirements and the intraoperative EEG findings topectomies, subpial resections, lobectomies, callosotomies and hemispherectomies were successfully performed. Their most important contribution to epilepsy surgery consisted in the development of a neuroleptic cocktail which allowed for an operation without narcotics also in children with one great advantage: the epileptic foci during intraoperative cortical EEG recording were not suppressed but, on the contrary, even more enhanced and better demarkable. For this investigation, they obtained a price from the Soviet Academy of Sciences.

Conclusion Neurosurgery in Bratislava was in the 1950s an important center for operative therapy of intractable epilepsy with a high standard regarding preoperative patient selection and applied anesthesiological and surgical techniques.

Poster Abstracts

P-01

Serial Expression of Apoptosis and Hypoxia Inducible Factor in Rat Bilateral Common Carotid Arteries Occlusion Model

C. T. Moon[1], Y. I. Jeon[1], Y. C. Koh[1], C. H. Yu[2], J. Y. Yie[2], J. H. Sur[2]
[1]Department of Neurosurgery, Konkuk University Hospital, Seoul; [2]Department of Veterinary Pathology, College of Veterinary Medicine, Seoul, Korea

Introduction Permanent bilateral occlusion of the common carotid arteries (2VO) in the rat has been known as a model to investigate the effects of chronic cerebral hypoperfusion because of satisfactory recovery from surgery, relatively low costs and ethical acceptance. As opposed to stroke research, 2VO studies have the aim of investigating the long-term effects of chronic cerebral hypoperfusion. The TUNEL assay is a commonly used tool to investigate apoptosis. Hypoxia-inducible factor 1 (HIF-1), a key regulator of hypoxia, is a heterodimer composed of an O_2-regulated HIF-1α subunit and a constitutively expressed HIF-1 subunit. We analyzed serial expression of HIF-1α and apoptosis in this model by immunohistochemistry, Western blot and TUNEL assay.

Materials and Methods Adult male Wistar rats (body weight 280–350 g, about 10 weeks of age) were anesthetized with 3 % isoflurane in 70 % N_2O and balance of O_2. Briefly, following a midline incision, both common carotid arteries were exposed. Bilateral common carotid arteries were separated from the vagal nerves and bilateral common carotid arteries occlusion (BCAO) was performed with 3-0 silk. The time points studied were 1, 2, 4, 8 and 12 weeks after occlusion, with n = 6 animals subjected to BCAO, and n = 2 to sham operation at each time point. After different survival periods, brains were fixed by intracardiac perfusion fixation with 4 % neutral-buffered paraformaldehyde for immunohistochemistry (IHC) and TUNEL assay. For Western blot, hippocampus were obtained from pooled (n = 6 per group) brain samples. Antibody of HIF-1α were applied for IHC and Western blot.

Results TUNEL-positive cells were first detected in week 1. Four weeks after bilateral carotid artery occlusion, extensive DNA fragmentation was notable within CA1 and dentate gyrus. In week 12, TUNEL-positive cells were rarely detected and close to sham in the operation group. HIF-1 immunoreactivity appeared in hippocampus in week 1 after BCAO. The density of HIF-1α was markedly increased in week 2. Then, the density was decreased progressively after these time points and in week 12, expression was close to sham operation. In Western blot analysis, expression of HIF-1 yielded the same result as in IHC.

Conclusion HIF and TUNEL assays showed serial changes from weeks 1–12 after bilateral common carotid artery occlusion. These findings might be helpful to understand the pathophysiology of chronic hypoxia of the brain.

P-02

Two Cases of Cerebral Venous and Sinus Thrombosis Related With Oral Contraceptive Use Treated on a Neurosurgical Ward

W. Pietraszko, M. Moskała, W. Libionka, S. Dyszkiewicz
Department of Neurosurgery and Neurotraumatology, Collegium Medicum Jagiellonian University, Krakow, Poland

Introduction Cerebral venous and sinus thrombosis (CVST) is a rare condition causing stroke, especially in young patients. One of the risk factors of CVST, apart from some hereditary conditions, can be the use of oral contraceptives (OCs).

Methods We present two cases of young women, with OC use in anamnesis, admitted to the neurosurgical ward because of intracerebral non-traumatic hemorrhage.

Results The first patient was admitted in good condition (GCS 15) after epileptic seizure. The second was unconscious on admission (GCS 6) with anisocoria. Computed tomography (CT) showed hemorrhagic stroke of the right temporal lobe and small subdural hematoma in the first case and hemorrhagic stroke of the left temporal lobe in the second. Laboratory tests were normal except increased levels of D-dimer in both cases. Decompression craniectomy was required in the second case, despite edema-reducing intensive treatment. Anticoagulation therapy with heparin was administered in both cases; in the second one 24 hours after craniectomy. Subtraction angiography (DSA) and MRI did not reveal any vascular malformations except impairment of blood flow through transverse and sigmoid sinus in the first case and through transverse and petrosal sinus in the second. Favorable functional outcome in both cases was achieved on discharge.

Conclusion Despite introduction of new OC drugs, the risk of appearance of CVST continuously exists.

Decompressive craniectomy may be required as a life-saving intervention in severe CVST with hemorrhage and increased intracranial pressure but precise indications and techniques for surgical decompression and anticoagulant treatment of CVST should be evaluated in future studies.

P-03

Improvement of the Reserve Capacity and Neurological Outcome After EC-IC Bypass in Patients with Intracranial Atherosclerosis

P. W. Huh, D. S. Kim, K. S. Cho, D. S. Yoo, S. G. Kang, D. K. Jang
Department of Neurosurgery, Uijeongbu St. Mary's Hospital, The Catholic University of Korea College of Medicine, Uljeongbu, Korea

Purpose The present study tried to analyse the postoperative changes of neurological status and vascular reserve capacity in cases of hemodynamic insufficiency due to atherosclerotic internal carotid artery (ICA) and middle cerebral artery (MCA) stenosis or occlusion after EC-IC bypass surgery.

Materials and Methods Between September 2002 and December 2007, 45 patients with hemodynamic insufficiency and decreased perfusion after acetazolamide stimulation test on SPECT were operated by superficial temporal artery to middle cerebral artery (STA-MCA) bypass. They were followed up for more than 6 months after surgery. Postoperative changes of vascular reserve capacity, new collateral vessels through bypass, neurological status and recurrences of symptoms were evaluated.

Results Forty-one (93.3 %) patients who demonstrated good collateral vessels after bypass surgery had enough cerebral blood flow from the anastomosis to survive. These patients showed not only improvement of vascular reserve capacity, but also reversed neurological deficits. There were no recurrent symptoms in these patients during the follow-up period. Four patients (7 %) who demonstrated the only patent bypass and insufficient collateral vessels did not show the improvement of vascular reserve capacity. Transient ischemic attack was sustained in these patients. Two patients still have permanent neurological deficits after surgery.

Conclusions Ischemic territories of brain with decreased vascular reserve capacity were normalized after bypass in most patients. Ischemic attacks never recurred in these patients with restored blood flow through the anastomosis.

P-04

Analysis of Surgical Aspects of Non-Branching Site Aneurysms of ICA

D. K. Jang, P. W. Huh, D. S. Kim, D. S. Yoo, K. S. Cho, S. G. Kang, J. K. Park
Department of Neurosurgery, Uijeongbu St. Mary's Hospital, The Catholic University of Korea College of Medicine, Uljeongbu, Korea

Background and Object Most intracranial saccular aneurysms stem from the divergent point between a parent artery and its branch. Sometimes intracranial ICA aneurysms have arisen from the non-branching sites of ICA. These aneurysms have not been easy to treat compared with branching site aneurysms. In this study, we analyzed the clinical characteristics of aneurysms arising from the non-branching sites of ICA from the point of view of surgery.

Methods From 2003–2007, 346 intracranial aneurysms were treated at our institute. Among them, 19 (5.8 %) aneurysms were non-branching site aneurysms of ICA. These aneurysms were analyzed according to the treatment strategy by site, size, direction, configuration in the surgical videos retrospectively.

Results The ages of the subjects ranged from 39–79 years (mean 56.9) ; 14 (73.7 %) were female and 5 (26.3 %) male. Ruptured cases were 13 (68.4 %) and unruptured 6 (31.6 %). Five (26.3 %) had a history of hypertension, and one had taken aspirin for 20 years. All ruptured cases had atherosclerosis of the vessel wall and half of the unruptured cases had it, too. There were 5 cases (26.3 %) of multiple aneurysms. The most common site was the communicating segment of ICA (63.2 %), followed by the ophthalmic segment (36.8 %). Those arising from the dorsal wall of the ICA were 7 (36.8 %), ventral wall 6 (31.6 %), lateral wall 4 (21.1 %) and medial 2 (10.5 %). Saccular types of them were 10 (52.6 %) and blister-like aneurysms 9 (47.4 %). Except for one large-sized aneurysm, all were small-sized ones. We treated fifteen cases (84 %) by clipping only, one by clipping and bypass surgery and three by wrapping. Intraoperative transfemoral temporary balloon occlusion technique was used in two cases. 11 (57.9 %) had good outcomes and 8 (42.1 %) had poor outcomes.

Conclusion and Discussion Fortunately, 2 dorsal aneurysms could be clipped by the neck of aneurysm with the partial wall of ICA in our cases. Most aneurysms arising from the dorsal wall of ICA were too dangerous to clip because of no neck of aneurysm as the blood blister like aneurysm. But most aneurysms from the ventral or lateral, medial wall of ICA were saccular form aneurysms which were easily clipped, branching site or not, large or not. For the treatment of dorsal aneurysms of ICA, we should be ready for any kind of treatment strategy, such as EC-IC bypass, wrapping, and trapping.

P-05

Surgical Options for Failed Endovascular Treatment of Cerebral Aneurysms

A. Gruber, C. Dorfer, H. Standhardt, G. Bavinzski, E. Knosp
Department of Neurosurgery, Medical University of Vienna, Austria

Introduction Despite obvious advantages of endovascular management of cerebral aneurysms in certain cases and ongoing improvements of neurointerventional techniques, coil embolisation can result in suboptimal angiographic and clinical results that may require surgical procedures to provide definitive treatment.

Methods From 1992–2008, a total of > 1300 patients was treated for cerebral aneurysms at our institution. The decision to perform either surgery or endovascular treatment for an individual aneurysm was made by a team of neurosurgeons cross-experienced in the application of both techniques. Patient data relevant for this study were prospectively entered into a computerised data base and were available for retrospective analysis. This report is based on those patients, in whom endovascular management failed for various reasons and who underwent cerebral aneurysm surgery thereafter.

Results The most frequent shortcoming of endovascular treatment was coil re-compaction, resulting in recurrent aneurysms not feasible for coiling or stent-assisted coiling in 44 patients. Of these, 42 patients were treated by clipping of the previously coiled aneurysm, and 2 patients underwent endovascular parent artery occlusion under bypass protection. Delayed aneurysm rupture after coiling required aneurysm clipping in 2 cases and parent artery occlusion under bypass protection in another case. Acute aneurysm rupture during coil embolisation not manageable by continued coiling occurred in 3 patients. In these cases, urgent clot evacuation in conjunction with aneurysm clipping was performed. In 1 case of an acutely ruptured anterior communicating artery aneurysm, coil prolapse resulted in mechanical occlusion of the ipsilateral pericallosal artery and was treated by acute craniotomy, surgical coil retrieval, and clipping of the aneurysm.

Conclusion Surgical treatment options for failed endovascular management of cerebral aneurysms are required despite the ongoing significant progress in endovascular techniques. Among these surgical procedures: emergency craniotomy for aneurysm ruptures during embolisation, emergency aneurysm clipping in cases of aneurysm re-ruptures after insufficient endovascular treatment, and surgical repermeation techniques in cases of coil dislocations, including mechanical coil removal and/or bypass procedures.

P-06

Combined Endovascular and Surgical Treatment of Orbito-Frontal Arteriovenous Malformation

M. Choc[1], F. Šlauf[2], M. Novák[2]
[1]Department of Neurosurgery and [2]Radiodiagnostic Clinic, Charles University Hospital, Pilsen, Czech Republic

Introduction Arteriovenous malformations (AVM) of scalp and facial area including orbits are hardly solved states for supplying from many arterial sources and considerable plasticity and tendency to revascularization after partial removal.

The authors present the successful treatment of a 30-year-old woman with the extent arteriovenous malformation in the right orbit and frontal scalp area growing for 16 years.

Method AVM supplied by ophthalmic artery and both external carotid arteries was treated in several steps. First, in two steps the branches of ophthalmic artery feeding the AVM were embolized and then the AVM was completely removed surgically from the frontal area and anterior part of orbit in three steps.

Result AVM of the fronto-orbital area causing a mechanical obstacle to vision of the right eye was completely removed without trophic defect of skin flap. Visual function and movement of the eyeball was left normal. Clinical and cosmetic effect of therapy is excellent in 6-year follow-up.

Conclusion Combined endovascular and surgical treatment of huge orbito-frontal AVM led to permanent clinical and cosmetic effect.

P-07

Value of Histopathological Findings for the Prediction of Vasospasm and Functional Outcome in Aneurysmal Subarachnoid Hemorrhage

M. Holling[1], A. Jeibmann[2], B. Fischer[1], J. Gerss[3], H. Wassmann[1], W. Paulus[2], M. Hasselblatt[2], F. Albert[4]
[1]Department of Neurosurgery, [2]Institute of Neuropathology, [3]Coordinating Centre for Clinical Trials and the Insitute of Medical Informatics and Biomathematics, University Hospital Münster; [4]Department of Neurosurgery, Paracelsus-Klinik Osnabrück, Germany

Introduction Aneurysmal subarachnoid hemorrhage still carries a bad prognosis often related to the development of vasospasms. Even though a variety of clinical and radiological predictors have been well established, studies on the prognostic value of histopathological features remain scarce. We therefore examined the prognostic value of clinical, radiological and histopathological parameters in a series of 91 neurosurgically treated patients with aneurysmal subarachnoid hemorrhage.

Methods Clinical, radiological and histological data of 91 patients treated neurosurgically for aneurysmal subarachnoid hemorrhage were examined. Impact of the aforementioned features on vasospasm and outcome at discharge were analyzed using logistic regression analysis.

Results On multivariate analysis, taking into account all clinical, radiological and histological factors, aneurysm size (odds ratio [OR] 1.22, 95 %-confidence interval [CI] 1.05–1.42; p = 0.009) and inflammatory infiltrates of the aneurysm wall (OR 6.35, 95 %-CI 2.32–17.36; p = 0.0001) remained the only independent factors predicting the occurrence of vasospasm, whereas the development of vasospasm (OR 9.82, 95 %-CI 1.83–52.82; p = 0.008), Hunt and Hess grade (OR 5.61, 95 %-CI 2.29–13.74; p = 0.0001), age (OR 1.09, 95 %-CI 1.02–1.16; p = 0.013), elevated white blood cell concentration (OR 1.29, 95 %-CI 1.01–1.64; p = 0.04) and Fisher grade (OR 4.35; 95 %-CI 1.25–15.07; p = 0.015) contributed best to predict functional outcome.

Conclusion Neuropathological investigation of lymphocytic infiltrates in the aneurysm wall will provide an additional simple and robust predictor for the occurrence of vasospasms equivalent to the known clinical and radiological features.

P-08

Clinical Analysis in Cerebral Aneurysms of Posterior Circulation

D. J. Lim, T. H. Kwon, H. S. Chung, H. K. Lee, Y. G. Chung, J. Y. Park
Department of Neurosurgery, Korea University Medical Center, Seoul, Korea

A series of 106 consecutive patients with cerebral aneurysms of the vertebrobasilar system is presented. Mean age was 53 years (range 28–81 years). The overall mortality and morbidity rates at 6 months were 15.1 % (16/106) and 13.2 % (14/106), respectively. The most common cause of death was rebleeding (68.8 %, 11/16).

Treatments consisted of neck clipping in 23 patients, wrapping in 6, and endovascular therapy in 32. All of these treatment modalities were carried out after 2 weeks from initial insult. Treatment outcome was evaluated with Glasgow Outcome Scale (GOS) at 6 months after initial insult. Patients with Hunt and Hess (H-H) Grades I and II at admission had good outcome in 72.5 %. Patients with aneurysms which were located proximally had better outcome than those with a distal aneurysm (100 % good outcome vs 66.7 %). Twenty-six (81 %) out of 32 patients who were treated with endovascular therapy showed good outcome, whereas only 59.1 % of patients who underwent either clipping or wrapping showed good outcome. There was a statistically significant difference ($p < 0.05$). As for the comparison of outcome according to the size of an aneurysm and age of patients, we found no statistically significant differences.

These results indicate that the location of an aneurysm is an important prognostic factor in the vertebrobasilar system. Endovascular treatment may be a promising treatment option and considering the very high mortality from rebleeding early management may contribute to reduce the mortality and morbidity in posterior circulation aneurysm.

P-09

Cerebral Gangliogliomas: A Case Report

P. Fadrus[1], T. Svoboda[1], J. Musil[1], M. Smrčka[1], V. Vybihal[1], L. Křen[2]
Departments of [1]Neurosurgery and [2]Pathology, University Hospital Brno, Czech Republic

Introduction Ganglioglioma is an uncommon primary lesion of the central nervous system, representing less than 2 % of all intracranial tumors and they appear more commonly in children and young adults and tend to occur in the medullary region. The mixture of glial and differentiated nerve cells distinguishes this neoplasm from other intrinsic brain stem tumors. The favorable prognosis associated with ganglioglioma makes early recognition important for early diagnosis and treatment. PET and MR scans were realigned to combine functional and morphologic information using a multipurpose imaging tool.

Methods Gangliogliomas were diagnosed from brain tumors surgically resected at our department over the last five years. We present four cases of supratentorial ganglioglioma, and one case with infratentorial localization with neurological assessment of ataxia. They were investigated with magnetic resonance (MR) and positron emission tomography (PET) pre- and postoperatively. MR study included T1-, T2-, and post gadolinium T1-weighted sequences in the axial, sagittal, and coronal planes. Patients were treated surgically by temporal and suboccipital craniotomy. By using a surgical microscope, a gross total resection was performed.

Results MR imaging demonstrated a mass of homogeneous low signal intensity and on T1-weighted images with no enhancement with gadolinium, and of relatively homogeneous high signal intensity on T2-weighted images. PET scans were inspected visually for tumor metabolic activity relative to activity of normal gray and white matter when there were hypermetabolic areas corresponding to a pathologically proven ganglioglioma. Histopathologic specimens with immunostaining revealed a ganglioglioma grade I (WHO) in both cases. Astrocytes were the commonest glial component of gangliogliomas, either pilocytic or fibrillary. The follow-up duration is 18 and 28 months with improvement of neurological status without evidence of tumor recurrence.

Conclusions Gross total resection as it was performed in our patient appears to be curative. Subtotal resection or biopsy carries the risk of recurrence. Radiation therapy is regarded as not indicated after gross total resection and should be restricted to only high-grade cases or special indications, such as when resection is impossible. We conclude that these tumors are rare and should be treated surgically, aiming at total removal. If it is not possible or in case of reoccurrence the patient should be followed and radiotherapy could be considered.

P-10

Gliomatosis Cerebri: A Report of Cases Treated Stereobiopsy and the Radiation Therapy

P. Fadrus[1], T. Svoboda[1], M. Smrčka[1], J. Musil[1], E. Neuman[1], A. Šprláková[2]
Department of [1]Neurosurgery and [2]Radiology, University Hospital Brno, Czech Republic

Introduction Gliomatosis cerebri (GC) is the diffuse infiltration of white and gray matter with neoplastic glial cells of varying levels of differentiation. The cerebral hemispheres are more commonly affected, with involvement of the cerebellum, brain stem, and medulla being less common. Typically, there is a relative lack of mass effect, with characteristic preservation of the underlying neuroanatomic architecture. Most cases with GC reported in the literature were diagnosed at autopsy and only few reports exist regarding therapeutic options in GC. We discuss the etiology, clinical and radiological manifestation, and management of this rare condition in the light of other reported cases in the literature.

Methods We report seven cases of GC treated in our department over the last four years. Characteristically on MRI, there was a poorly defined subtle diffuse high T2 signal involving at cerebral lobes and involving both gray and white matter. Lesions are isointense to hypointense relative to normal brain on T1WI signal. The diagnosis was confirmed neuropathologically after CT image-guided stereo biopsy.

Results According to neuropathological investigation there was diffuse proliferation of glial elements infiltrating normal tissue, with destruction of myelin sheath and only slight neuronal and axonal damage. Perineuronal and perivascular tumor spread was also seen on histology findings. After image-guided stereo biopsy the external radiation therapy was performed and led to a complete recovery of all clinical signs in both patients. Follow-up examinations 6 and 12 months after diagnosis showed a reversal of clinical condition and stationary control of radiological findings in five and the progression of neurological condition in the two of these patients.

Conclusions MRI should be used as a primary imaging study in the evaluation of GC and for the determination of the target points for image-guided stereo biopsy. Considerable variation in the natural course of the disease precludes conclusions regarding the impact of radiation therapy on survival. Radiation therapy according to literature in GC is associated with temporary improvement or stabilization of clinical symptoms in the majority of these cases.

P-11

"Awake Surgery" for Low-Grade Glioma Resection

T. Svoboda[1], E. Neuman[1], J. Duba[2], P. Bednarik[3], P. Fadrus[1]
[1]Department of Neurosurgery, [2]Department of Anesthesiology, Resuscitation and Intensive Care MF MU and Faculty Hospital, Brno; [3]Department of Imaging Methods MF MU and St. Anne's University Hospital, Brno, Czech Republic

Utilization of intraoperative monitoring plays an important role in the preservation of quality of life for a patient with a low-grade glioma. A specific form of monitoring is the resection with vigilant phase in the case of tumor localisation in the speech area. Preoperative preparation of patients consists of performing fMRI and speech therapist examination. Anesthesia is conducted as TIVA with spontaneous ventilation on O_2 mask, as a kind of "asleep-awake-asleep" carried out by ultra-acting continuous served anesthetics. Anesthesia proceeds primarily without invasive providing of airway for easier passing between sleep and awake state. Straight cortical stimulation in the vigilant phase is performed using the Ojemann cortical stimulator (Integra) and modified Boston test is used for the evaluation of speech function during stimulation. We have operated 6 patients by this method since January 2007. Criteria used for application of awake resection are: low-grade glioma, tumor placing within or near the speech area, patient without speech function disturbance and very good compliance. 5 patients were without post-operative deficit, mild dysphasia appeared in one patient. Convulsion occurred once at stimulation. According to our experience, this method is a benefit for patients with low-grade glioma, especially in a speech area, and enables safe resection in this eloquent area of the brain.

P-12

Two Cases of Gliomas Related To Intraventricular Hemorrhage

M. Betlej, W. Pietraszko, M. Moskała, W. Libionka
Department of Neurosurgery and Neurotraumatology, Collegium Medicum Jagiellonian University, Krakow, Poland

Introduction The most common causes of intraventricular hemorrhage (IVH) are vascular malformations, hypertension, traumas and anticoagulant treatment. The etiology of IVH remains unknown in about 20 %. Tumor of the central nervous system (CNS) is a very rare cause of IVH estimated at 2 %. Appearance of IVH accompanying intracerebral hemorrhage or tumor is also a poor prognostic factor.

Methods We present two cases of tumor-related IVH, treated with intraventricular administration of recombinant tissue plasminogen activator (rtPA). To evaluate the range of hemorrhage and rate of blood clots removal we used the Graeb scale.

Results Two unconscious patients, with sudden onset of symptoms, were admitted to the neurosurgical ward. Computed tomography (CT) revealed severe intraventricular hemorrhage (Graeb 12 and 9). Open drainage of the ventricular system with intraventricular administration of rtPA was applied. Quick removal of the blood clot in control CT and gradual improvement of neurological condition were observed. Control CT with contrast medium revealed tumors located close to the lateral ventricle in the first case and in the vermis of the cerebellum in the second. Further investigations confirmed low-grade gliomas in both cases.

Conclusion Outcome of patients with IVH depends on the condition on admission and range of hemorrhage. Recombinant tissue plasminogen activator is an efficient local fibrinolytic agent that enables safe and quick removal of blood clots from the ventricular system. Early evacuation of intraventricular blood clots stabilizes and improves the clinical condition of patients and may accelerate time to diagnose a tumor as cause of the hemorrhage.

P-13

Carotid Body Tumors – Diagnosis and Surgical Treatment

E. Mrazkova[1,2], J. Mrazek[1,2], J. Horacek[3], T. Hrbac[4], V. Prochazka[5], M. Häringova[5], J. Mayzlik[2,6]
[1]Department of ENT, University Hospital, Ostrava; [2]Department of Surgical Studies, [3]Department of Pathological Anatomy, Medico-social Faculty, Ostrava; [4]Department of Neurosurgery, [5]Department of Radiology, [6]Department of Surgery, University Hospital, Ostrava, Czech Republic

Introduction Chemodectomas glomus caroticum are relatively rare tumors and may pose a difficult surgical problem because of their vascularity and compression of the cranial nerves in the neck.

Methods 13 patients were examined and 10 operated with diagnosis carotid body tumor from 1992–2006 at the University Hospital of Ostrava. Preoperative, operative and postoperative data were collected from 7 women and 3 men (age range 16–64, mean 39.2). As diagnostic methods, Doppler color flow imaging, NMR and DSA were used. All of the tumors were large and hormonally inactive. Two patients underwent surgical tumor resection with preoperative embolisation and eight patients without. Seven subadventitial preparations were made and extirpation of the tumor sec. Gordon and Taylor (6 total and 1 subtotal), 1 resection of the tumor with angioplastics of the bifurcation of ACC, 1 *en bloc* resection and reanastomosis ACI and 1 *en bloc* resection and substitution by ACI with the prosthesis.

Results 9 patients had their tumors removed totally (recurrences were not observed), with 1 patient a residuum on ACI was left; however, after a 5-year follow-up it remains the same and does not cause any disorder. Transient hemiplegia occurred in one case. 3 patients refused surgery or the tumors were unresectable. There were no perioperative deaths but one XII. cranial nerve palsy with improvement to 6 months.

Conclusion MR angiography can be useful to demonstrate the flow of blood within vessels and it represents a well-known imaging device for surgical planning. Doppler color flow imaging with the occlusion test and angiography provide essential mainstays for definite diagnosis. Early surgical removal is an ideal treatment and it is recommended to minimize major postoperative morbidity.

P-14

Fluorescence in Microneurosurgery as a Perioperative Diagnostic Method

M. Smrčka, E. Neuman, V. Juráň, T. Svoboda, P. Fadrus
Neurosurgical Department, University Hospital Brno, Masaryk's University Medical School, Czech Republic

Introduction Fluorescence in conjunction with microsurgical operative technique is currently used in neurooncology in operations of high-grade gliomas and in vascular neurosurgery to check the patenty of cerebral arteries after the clip is applied. As such we can consider fluorescence as a special perioperative diagnostic method.

Methods In high-grade gliomas, 5-ALA (5-amino levulinic acid) is given to patients 3 hours before operation. This substance is selectively captured in some malignant tumor cells, especially high-grade gliomas. After illumination by blue light the viable parts of the tumor give the reddish fluorescing color and thus are different from normal tissue. In vascular neurosurgery, indocyanine green is applied intravenously before and then after clip application. The result is fluorescence of perfused vessels after illumination by infrared light. This confirms a normal patenty of cerebral arteries and the occlusion of the aneurysm sac.

Material During the last 12 months, we used 5-ALA in 17 patients with high-grade gliomas. We were not able to detect fluorescence in two patients (once it was a histologically confirmed metastasis and once a recurrent high-grade glioma). In all other cases, fluorescence

revealed a residual tumor which was totally removed in 10 cases and thus radical resection of the tumor was achieved. In the remaining cases, radical resection could not be done due to the close vicinity of eloquent areas. During the same time period, we used indocyanine green in 5 cases of aneurysms and one AVM. According to the fluorescence diagnostics the position of the clip had to be changed in one case.

Conclusion The use of 5-ALA in high-grade glioma operations enables an increased radicality of resection by revealing residual tumor tissue. On the other hand, caution has to be applied since the visualised residual pushes the surgeon to further resection which might be counterproductive in eloquent regions. The use of fluorescence in vascular neurosurgery seems to be very promising and reliable.

P-15

Early Experiences with a Novel (Robot Hand) Technique in the Course of Microneurosurgery

A. Csókay[1], I. Valálik[1], Á. Jobbágy[2]
[1]Department of Neurosurgery, St. John Hospital, Budapest; [2]Department of Measurement and Information Systems, Budapest University of Technology and Economics, Budapest, Hungary

Introduction Physiological tremor may cause difficulties in microsurgery, in spite of using armrests. The new (robot hand) technique consists of the I–III finger support, which holds the instruments on a Bethlehem® bridge above the operation area and reduces tremor at the end of instruments.

Methods Exact measure of tremor reduction was performed. Last year, 23 microsurgical cases were operated on using the robot hand technique.

Results The tremors of the operating hand and the number of complications decreased significantly.

Conclusion Using this technique microsurgical work has become more precise.

P-16

MGMT Promoter Methylation Status in Choroid Plexus Tumors

A. Jeibmann[1], J. Mühlisch[2], A. Kruse[1], M. Frühwald[2], W. Paulus[1], M. Hasselblatt[1]
Institute of [1]Neuropathology and [2]Department of Pediatric Hematology and Oncology, University Hospital Münster, Germany

Introduction Epigenetic silencing of the MGMT (O6-methylguanine-DNA methyltransferase) DNA repair gene by promoter methylation is associated with better treatment response to temozolomide in malignant gliomas. Because temozolamide is currently being discussed as an add-on therapy in recurrent choroid plexus tumors, we aimed to determine the frequency of MGMT promoter methylation in choroid plexus tumors.

Methods MGMT promoter methylation status was assessed by Combined Bisulfite Restriction Analysis (COBRA) in a series of 35 choroid plexus tumors comprising 16 choroid plexus papillomas (WHO grade I), 12 atypical choroid plexus papillomas (WHO grade II) and seven choroid plexus carcinomas (WHO grade III).

Results Hypermethylation of the MGMT promoter was observed in 23 out of 35 choroid plexus tumors examined (66 %). Promoter hypermethylation was more frequently observed in choroid plexus papillomas (81 %) as compared to choroid plexus papillomas (58 %) and malignant choroid plexus carcinomas (43 %).

Conclusions Hypermethylation of the MGMT promoter is a frequent event in choroid plexus tumors. Assessment of MGMT methylation status might play a role in future clinical trials.

Supported by Deutsche Krebshilfe (Project 106156)

P-17

Protein Kinase D in Astrocytic Gliomas – a New Approach To Control Tumor Growth

M. Mrfka[1], B. Bernhart[2], H.G. Eder[1], W. Sattler[2]
Departments of [1]Neurosurgery and [2]Molecular Biology and Biochemistry, Medical University of Graz, Austria

Introduction Overexpressed or hyperactivated protein kinases C (PKCs) are among the most distinguished characteristics of malignant brain tumors. Thus, PKCs represent potent targets to interfere with glioma cell motility, invasion and proliferation and may represent new therapeutic avenues. Recently, a new family of serine/threonine protein kinases has been identified, namely protein kinase D1 (PKD1) (formerly known as PKC^{-}), PKD2 and PKD3. PKDs are now classified in a novel subgroup of protein kinases within the calcium/calmodulin-dependent kinases. PKD1 expression is high in brain tissue and PKD1 is important in the regulation of cell proliferation and apoptosis and modification of other kinases and plasma membrane proteins in cancer cells. These findings and the fact that the prognosis of patients with glioblastoma are poor despite novel therapies and nothing is known about PKD1 in brain tumors, made us investigate the function of PKD1 in glioblastoma and astrocytic gliomas.

Methods The present study aimed to investigate expression patterns of PKD1 in human astrocytic glioma biopsy material (WHO grades II–IV) and A172 glioblastoma cells, to clarify the impact of PKD1 on cell proliferation and to silence PKD1 expression by RNA interference (RNAi) and analyze the consequences on tumor cell growth.

Results We observed that PKD1 expression levels clearly correlate with tumor grading. Immunoreactive PKD1 levels in glioblastoma multiforme are 3-fold higher than in astrocytoma grade II. Furthermore, PKD1 is phosphorylated and active in primary glioblastoma cells and can be activated by phorbol-myristate-acetate (PMA) and PDGF (a potent growth factor) in the A172 glioblastoma cell line. Pharmacological inhibition with the indolocarbazole Gö6976 or silencing PKD1 by RNA-interference significantly reduced proliferation rates of glioblastoma cells in vitro.

Conclusion In summary, the results of the present study indicate that intervention on PKD1 might be a promising, useful and novel approach to interfere with the progression of glioblastoma and astrocytic glioma growth.

P-18

Mathematical Analysis of Morphological Changes Following I-125 Brachytherapy with a Polynomial Prediction Approach

Z. Kolumbán[1,3], J. Julow[1], Á. Viola[1], T. Major[2]
[1]Department of Neurosurgery, St. John's Hospital, Budapest; [2]Department of Radiotherapy, National Institute of Oncology, Budapest; [3]Medical School, Semmelweis University, Budapest, Hungary

Objective The volumetrical changes in tumor necrosis, reactive zone and edema referred to as "triple ring" appearing due to the low-dose rate I-125 interstitial irradiation of 20 inoperable low-grade gliomas. Mathematical expressions are provided to make the volumetrical changes predictable, the derived polynomials show the dynamics of "triple ring". Multivariate analysis of several different aspects is been carried out.

Methods Volumes of the three regions on image-fused control CT/MRI images were measured for a 48-month period. The delivered dose on the tumor surface was 50–60 Gy. Dose planning and image fusion were done with the BrainLab Target 1.19 software, mathematical and statistical computations were carried out with the Matlab numeric computation and visualization software. To determine the volumes, the control images with the triple rings were fused with the planning images.

Results Relative volumes normalized with respect to the volume of reference dose were calculated and plotted in the time domain.

First the mean values of volumes were determined from the patients' measured data, then polynomials were fitted to the mean values using the polynomial curve fitting method. The accuracy of our results was verified by correlating the predicted data with the measured ones.

Conclusions The polynomial prediction approach proposed reveals the dynamics of triple ring for 48 months. The derived polynomials and the multivariate analysis carried out afterwards help to (1) design the best treatment, (2) follow up the patient's condition and (3) plan re-irradiation if necessary.

P-19

Microsurgery Combined with Radiosurgery as Alternative Treatment for Large Vestibularis Schwannomas

E. M. Holl, V. Gellner, W. Kreil, S. Grossauer, P. Unger
Department of Neurosurgery, Medical University Graz, Austria

Introduction Difficulty of total resection of large vestibularis schwannomas (> 3 cm) is well known due to frequent trauma of cranial nerves. Especially paresis of the facial nerve reduces quality of life for patients. We evaluated treatment results of a combination of microsurgery and radiosurgery for patients with large vestibular schwannomas (VS).

Methods A retrospective review of 80 patients suffering from large unilateral VS treated between 1993 and 2005 by microsurgery and radiosurgery, with a mean follow-up of 40 months. Tumor size before microsurgery ranged from 3.1–5.5 cm. Tumor size before gamma knife treatment ranged from 1.7–3.9 cm. The margin dose ranged between 10 and 15 Gy. Tumor control was assessed with serial radiological imaging. Facial nerve paresis was assessed using the House-Brackmann Score.

Results Tumor control rate was achieved in > 98 % with only 5.33 % significant facial weakness. Trigeminal symptoms improved in 5.33 % but developed in 13.3 %. We determined stability in 60 % of patients with discernible hearing.

Conclusion The goal of management of large VS is total resection of tumor size and preservation of cranial nerves but frequent complications, especially affecting the facial nerve, are well known. We recommend combined treatment as an alternative for patients with large VS to save quality of life for patients and achieve growth control of the residual tumor.

P-20

Results of the Prospective Randomized Study of the Prodisc-C Total Disc Replacement versus ACDF for the Treatment of 1-Level Symptomatic Cervical Disc Disease. Two-Year Follow-Up

L. Peka, J. Steindler, R. Brzezny
Neurosurgery Department, Motol University Hospital, Prague, Czech Republic

Introduction Today, we witness a turning point for operations of degenerative spine diseases. Surgery techniques such as spinal decompressive procedures or rigid interbody fixations (ACDF) are in the segments C3–C7 recently expelled by non-rigid arthroplasty (total disc replacement, TDR).

Methods 50 patients operated for the symptomatic cervical disc disease (SCDD) were randomized (25 patients in each approach ACDF vs TDR; average ACDF age 48.5 ± 2.54 SD, 14 males, 11 females, min 31, max 70; average TDR age 47.1 ± 1.81 SD, 15 males, 10 females, min 28, max 63). The largest number of surgeries was done at level C5/6. Inclusion criteria covered disk herniation and chronic degenerative changes of low-grade osteophytes. All patients were reviewed electrophysiologically before surgery and at the end of the considered time interval. Patients with acute or subacute myelopathy were not contraindicated. Patient outcome was evaluated in a two-year follow-up with time intervals of 6 weeks, 3, 6, 12 and 24 months after surgery. Patients' states were reviewed by physical examination and radiographically. Subjective conditions were evaluated with the ten-point VAS (Visual Analog Scale) of the hand and neck, and the NDI (Neck Disability Index) scoring.

Results Physical examination verified improvements in all operated subjects. The state of patients with preoperative myelopathy stabilized. We prove statistically significant relief in VAS and NDI after surgery in comparison to the preoperative state in both groups. The most significant progress was recorded between weeks 6 and 12 after surgery in both groups. Better results in the Prodisc-C group were evidenced only in the early postoperative time. Electrophysiological testing showed similar trends to improve in all operated subjects.

Conclusions The neck of operated patients is fixated with a soft cervical collar for a few days. The Prodisc-C implantation method allows for a patient's early return to work with no substantial limitations in everyday life. This corresponds with better improvement in the Prodisc-C group early in the postoperative phase in comparison to the ACDF group. Late results of VAS and NDI of both groups equaled. Evaluation of the assumed TDR influence on the slowing down of the adjacent level disease needs a longer follow-up study of our operated patients.

P-21

Clinical Outcome of PLIF Using the Minimally Invasive B-Twin Expandable Spinal Spacer

J. Kleffmann[1], T. J. Kuhn[2], C. Busch[2], C. Schuckart[2], H. Mewes[2], A. Wilke[3]
[1]Philipps-Universität Marburg; [2]Wirbelsäulenzentrum Marburg; [3]Abteilung Orthopädie/Unfallchirurgie, Elisabeth Klinik Olsberg, Germany

Introduction To evaluate the outcome of posterior lumbar interbody fusion (PLIF) using the B-Twin Expandable Spinal Spacer (ESS) for patients with chronic lower back pain due to Degenerative Disc Disease and spondylolisthesis 1.

Methods A total of 94 patients (women 53, men 41) with chronic lower back pain underwent surgery from 2003–2006. Inclusion criteria comprised disabling lower back pain due to degenerative disc disease and/or spondylolisthesis 1, pain for > 6 months and no or inadequate response to conservative treatment. The B-Twin is an expandable spacer made of titanium that, once in place, can be expanded up to three times its initial diameter (5 mm cylinder when collapsed). In all cases, the B-Twin was implanted "stand-alone".

Results The mean age of the patients was 59.5 years (SD 10.5 y). A Visual Analogue Scale (VAS), the Oswestry Disability Index (ODI) and a medical examination were used to measure lower back pain, leg pain and disability. The mean ODI improved from 36.61 preoperatively to 22.80 at follow-up ($p < 0.01$). The mean VAS improved from 8.70 preoperatively to 3.57 directly postoperatively and 3.74 at follow-up examination ($p < 0.01$). Altogether, 85 patients (90.43 %) were satisfied at follow-up examination.

Conclusion The treatment of choice for lower back pain related to degenerative disc disease is PLIF using spacers. Clinical trials confirm fusion rates exceeding 90 %. The size and the fixed dimensions of conventional spacers result in sacrificing posterior stabilizing structures and secondary neurological damage. Owing to its expandable design the B-Twin reduces these risks.

Our results demonstrate that PLIF using B-Twin is a safe technique and provides good results in the treatment of patients with chronic lower back pain.

P-22

Bilateral Elevation of Pro-Inflammatory Cytokines (TNF-α, IL-6) in the Rat Dorsal Root Ganglia Following Unilateral Spinal Nerve Ligature

R. Jancalek[1,2], Z. Veselkova[2], I. Klusakova[2], I. Svizenska[2], P. Dubovy[2]
[1]Department of Neurosurgery, St. Anne's University Hospital and Medical Faculty, [2]Department of Anatomy, Division of Neuroanatomy, Medical Faculty, Masaryk University, Brno, Czech Republic

Introduction A spinal root injury induces structural and molecular changes in the associated dorsal root ganglia (DRG) that are related with development of neuropathic radicular pain. TNF-α and IL-6 are proinflammatory cytokines involved in neuronal responses to nerve injury and pathogenesis of the neuropathic pain.

Methods Ligature of rat lumbar spinal nerves (L4–L5) was used as an experimental model of neuropathic pain for investigation of TNF-α and IL-6 protein levels in both ipsi- and contralateral lumbar (L4–L5) and cervical (C6–C7) DRG. Rats were operated aseptically on a ligature of L4–L5 spinal nerves (SNL) and divided into 3 groups: naïve group (rat without any operation, n = 9); operated group (n = 36) with periods of survival for 1, 3, 7 and 14 days; sham-operated group (operated rats without nerve lesion, n = 18) with periods of survival between 3 and 14 days. Commercially available ELISA tests were used for quantitative analysis of TNF-α (RaD) and IL-6 proteins (BioSource).

Results Levels of TNF-α and IL-6 proteins were significantly increased from post-operation day 1, and rose up to 14 days from SNL operation not only in ipsi- and contralateral L4–L5 DRG, but also in ipsi- and contralateral C6–C7 DRG. Principally, elevation of TNF-α and IL-6 proteins was greater in lumbar than cervical DRG.

Conclusion The obtained data provide evidence for increased levels of TNF-α and IL-6 proteins not only in ipsilateral, but also in contralateral DRG. In addition, elevation of cytokines was measured not only in DRG associated with damaged nerve (L4–L5), but also in those non-associated with spinal nerve injury (C7–C8) in rat experimental neuropathic pain model. Therefore, stimuli for increased levels of proinflammatory cytokines in the DRG after unilateral spinal root lesion are probably of systemic character. These extensive changes may be the reason for failure of local therapy in some cases of the radiculopathy.

Supported by grants GACR 309/07/0121 and MSM0021622404.

P-23

Remittent Course of Spinal Cord Tumors

G. I. Okladnikov, K. I. Kharitonova
Neurosurgery Clinic of Novosibirsk Research Institute of Traumatology and Orthopaedics, Russia

Introduction Spinal cord tumors present a significant challenge in diagnosis and have a specific clinical course.

Methods The review of 300 patients with spinal cord tumors of different localization and histological structure is presented. Diagnosis was verified using conventional and advanced methods, as well as evidence of surgical intervention and histological study of tumors.

Results Analysis of clinical observation and neurological symptom dynamics allowed us to identify two main variances of spinal cord tumor onset and course: progredient and remittent.

Remittent course of spinal cord tumors was observed in 22 % of patients, being short-term or long-term remissions. The mean duration of remittent course was nearly 7 years. In this period, the disease was considered by neurologists as a manifestation of another pathological process for which a durable conservative treatment was performed. In full remission of neurological symptoms (rather rare cases) they regressed practically fully. In partial remission of the pain syndrome, the root and conductive pains were significantly reduced, especially after conservative treatment. Remission of the pain syndrome was noted in 15 % of cases, that of sensitivity impairment in 14.8 %, and of motor impairment in 12 %.

When an extramedullar tumor was localized at the dorsal surface of the spinal cord, usually more full and stable remission of motor impairments was observed, than in cases when it was localized at the ventral surface. We assume that this fact is hardly explained only by a tumor's direct mechanical effect on anterior roots and motor pathways of the spinal cord. A specific role must be evidently attributed to a reflector effect of the tumor on the vasomotor system of spinal cord vessels, particularly on radicular/medullar and anterior spinal arteries.

Remittent course incidence was highest in spinal neurinomas (47.1 %) and meningiomas (30 %), which is explained by their predominant extramedullar localization, resulting in largest changes in spinal blood circulation, liquor circulation, and in arachnoiditis, which are significant for remission occurrence and development. Clinical observations show that remission of neurological symptoms depends on tumor consistence. However, we can not reliably explain a remission of neurological symptoms only by some kind of tumor consistence and by spinal paratumoral arachnoiditis, since the influence of any other pathogenetic factors also can not be excluded.

Conclusion Thus, the remittent course of the tumor was observed in 22 %. This makes a clinician revise a conventional concept of the spinal cord tumor course and identify variances of its course, especially at the early stage of spinal pathology.

P-24

Respiratory Function after Brain Injury and Intracranial Bleeding

T. Kapapa[1], R. Firsching[2], M. Skalej[3], D. Woischneck[1]
[1]Neurochirurgische Klinik, Bereich Safranberg, Universitätsklinikum Ulm; [2]Neurochirurgische Klinik and [3]Abteilung für Neuroradiologie, Otto-von-Guericke Universität, Magdeburg, Germany

Introduction To evaluate the correlation of lesions of the brain as visualized in cranial magnetic resonance imaging (MRI) and the ability of spontaneous respiration.

Methods In a prospective concept, cranial MRI after traumatic brain injury or spontaneous intracerebral hemorrhage was performed in 250 subjects at an early stage. All MRI findings were correlated to respiratory conditions on the day of examination.

Results Thirteen subjects (5.2 %) had no spontaneous respiration. In these, a bilateral lesion of the distal medulla oblongata could be displayed. In four cases, no additional injuries of the brain stem were detected. These subjects awoke two days after impact with tetraparesis and apnea. Combined lesions of the medulla oblongata and other brain-stem regions were found in nine subjects. All these patients died without awakening. In the absence of a bilateral lesion of the caudal medulla oblongata, spontaneous respiration was always possible. A unilateral lesion of the caudal medulla oblongata was visualized in one patient, who had the ability of spontaneous respiration.

Conclusions This study confirms the presence of autonomous respiratory centers within the caudal medulla oblongata that allows sufficient adequate respiration in coma. Respiration ceases in the presence of a bilateral lesion within this area.

P-25

Rosuvastatin in the Management of Traumatic Brain Injury

J. H. Tapia-Pérez[1,2,3], M. Sánchez-Aguilar[1], J. Torres-Corzo[2], A. Gordillo-Moscoso[1], P. Mandevile[1], J. Chalita-Williams[2], R. Firsching[3]
[1]Clinical Epidemiology, Faculty of Medicine, Universidad Autónoma de San Luis Potosí, San Luis Potosí, Mexico; [2]Neurosurgery, Hospital Central „Dr. Ignacio Morones Prieto", San Luis Potosí, Mexico; [3]Department of Neurosurgery, Universitätsklinikum Magdeburg, Germany

Introduction Traumatic brain injury (TBI) persists as a worldwide health problem without effective treatment. The pleiotropic effects of statins have demonstrated improvement after experimental TBI in rats. There are no available trials in humans in this respect.

Methods Double blind randomized clinical trial add-on of patients with TBI, age 16–50 years, GCS 9–13, and intra-cranial lesions by CT scan. We excluded those with previous head injury or severe disability; administration of known drugs as modifiers of statin metabolism; multisystemic trauma; surgical lesion or isolated in brainstem; allergy; hepatopathy or myopathy; prior treatment in another clinic; pregnancy. Every patient received the same treatment and was randomly allocated to the rosuvastatin (RVS) or placebo group for 10 days. We evaluated change on lesions at 72 hours with the Fisher and Marshall scales and Amnesia-Orientation by GOAT; also demographic, clinical and laboratorial variables at admission were studied.

Results We analyzed 8 patients with RVS and 13 controls with similar basal characteristics. Changes in proportion of patients with category Fisher I was 12.5–100 % with RVS versus 15.3–76.9 % with placebo. The change of Marshall I was from 0–50 % and 15.3–23 %, respectively. Linear regression models for both scales demonstrated an association of progression with basal category and statins ($p < 0.05$, eta square 6–10 %). By Cox regression the RVS administration showed a reduction of amnesia time with a Hazard Ratio of 53.76 (95 %-CI, 1.58–1824.64), this adjusted by early intubation, basal leucocytes, basal Marshall and Fisher score in CT scan, change of IL-1 levels, and lesion side.

Conclusion Statins could be useful for the quick resolution of lesions and memory recovery after TBI. Additional studies are needed in order to determine the optimal dose and type of statin.

P-26

Significant Elevation in Plasma Concentrations of IgE Following Isolated Severe Head Injury Suggesting TH2 Dominance

A. Mrlian[1], M. Smrčka[1], M. Klabusay[2]
Departments of [1]Neurosurgery and [2]Haematooncology, Faculty Hospital, Brno, Czech Republic

Introduction It is known that an increase in plasma IgE concentrations follows traumatic head injury. In our present study, we followed the course of IgE development to detect if any correlation existed with the occurrence of extracranial complications. We also determined if IgE elevation showed relevance for the outcome.

Patients and Methods 121 patients admitted to our department after craniocerebral injury, GSC < 8, 19–79 years, treated according to guidelines, with both conservative and surgical interventions. Within the first 24 hours, peripheral venous blood was gathered. We repeated this procedure every third day until patients were discharged. We enrolled all extracranial infectious complications in our study. The outcome of our patients 6 months after injury was evaluated using the Glasgow Outcome Scale.

Results IgE elevation did not show any effect either on the outcome or on the incidence of an extracranial complication. IgE levels were multiple increased ($p < 0.01$) directly upon arrival in 88 % of the patients. Then the levels rose steeply and continuously, reaching mean concentrations > 2500 units/ml. IgE concentrations were further increased in patients showing a lower GCS score upon admission ($p < 0.05$).

Conclusions Our findings conclude a significant increase of IgE concentrations following severe head injury. This may indicate a T_H2 type immune response, thus an increased risk for developing an infection. There is a possibility to use IgE as an independent predictor showing the degree of impairment in the T_H cell balance and increased susceptibility to infectious diseases after head trauma.

P-27

Surgical Complication of DBS

J. Chrastina, Z. Novák. I. Rektor, M. Baláz
Department of Neurosurgery and 1st Department of Neurology FH St. Ann and MF MU in Brno, Czech Republic

Introduction Until 2006 more than 35,000 neurostimalation systems were implanted worldwide in more than 500 specialized centers. This simple fact together with literature data provides evidence for the benefit of deep brain stimulation in the treatment of motor problems in Parkinson's disease. According to the analysis of the results of 1761 surgeries for Parkinson's disease in 71 US hospitals mortality does not exceed 0.2 %, the incidence of permanent neurological deficits is 1.8 %, but the incidence of mechanical and infectious complications is reported between 3–50 %.

Method Retrospective analysis of our own surgical series and literature data.

Results The benefit of deep brain stimulation for the quality of life together with economical aspects strongly enhances the need to deal with the complication with maximum effort aiming at system preservation. But prevention remains the most efficient measure in coping with infection. In our small group of patients, the incidence does not exceed the literature rates (8 %).

Conclusion The need for complex presurgical evaluation with infectious foci identification and eradication should be stressed. Immunological evaluation with adequate prophylaxis is an absolute prerequisite in patients suffering from repeated infections. The role of not only all expy team members, but all the doctors treating the patient for any illness should be stressed. Wound infection and implant complications are the most frequent causes of prolonged hospital stays.

P-28

Bilateral Pallidal Deep Brain Stimulation in a 14-Year-Old Girl with Hallervorden-Spatz Disease – Specificity of Surgical Procedure in a Rare Case

W. Libionka[1], T. Mandat[2], T. Kmieć[3], K. Stachura[1], W. Pietraszko[1], M. Moskała[1]
[1]Department of Neurosurgery and Neurotraumatology, Jagiellonian University School of Medicine, Krakow, Poland; [2]Department of Neurosurgery, M. Sklodowska-Curie Memorial Cancer Center and Institute of Oncology, Warsaw, Poland; [3]Department of Neurology and Epileptology, The Children's Memorial Health Institute, Warsaw, Poland

Introduction Neurodegeneration with brain iron accumulation (NBIA), formerly known as Hallervorden-Spatz disease, is a heterogeneous group of progressive extrapyramidal disorders with radiographic evidence of focal iron accumulation in basal ganglia. Mutations in the PANK2 gene account for the majority of NBIA cases. Clinically, the syndrome is characterized by dystonia and a pathognomonic pattern on brain MRI, called the eye-of-the-tiger sign. There have been only single case reports detailing pallidotomy or pallidal deep brain stimulation (DBS) for medically refractory Hallervorden-Spatz dystonia.

Case Report The authors present the case of a 14-year-old girl with the PANK2 gene mutation who suffered from intractable generalized dystonia for 4 years. She was dependent for activities of daily living because of continuous severe dystonic movements in the face, tongue, neck, upper and lower extremities. The Burke-Fahn-Marsden (BFM) Dystonia Rating Scale score was 90 points (maximum 120 points). Bilateral DBS of the globus pallidus internus was performed under general anesthesia, using microelectrode recording and macrostimulation, and resulted in a still progressing improvement in motor functioning and dystonic symptoms with a reduction in disability (the BFM score improved to 60 points 2 weeks after the operation).

Conclusion Bilateral pallidal DBS is an effective and safe treatment option for intractable generalized dystonia in Hallervorden-Spatz syndrome. Intraoperative neuromonitoring in a patient under general anesthesia has shown its value for optimization of DBS electrode placement.

Mitteilungen aus der Redaktion

Besuchen Sie unsere

zeitschriftenübergreifende Datenbank

☑ **Bilddatenbank** ☑ **Artikeldatenbank** ☑ **Fallberichte**

e-Journal-Abo

Beziehen Sie die elektronischen Ausgaben dieser Zeitschrift hier.

Die Lieferung umfasst 4–5 Ausgaben pro Jahr zzgl. allfälliger Sonderhefte.

Unsere e-Journale stehen als PDF-Datei zur Verfügung und sind auf den meisten der marktüblichen e-Book-Readern, Tablets sowie auf iPad funktionsfähig.

☑ **Bestellung e-Journal-Abo**