

# Symposium of the Belgian Society for Neurosurgery

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Mont-Godinne, april 27<sup>th</sup> 2004

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## Spinal Neurosurgery

**Management of cervical fractures in ankylosing spondylitis.** C. A. SMETS<sup>1</sup>, D. PEUSKENS<sup>1,2</sup>, F. VAN CALENBERGH<sup>1</sup>, F. WEYNS<sup>2</sup>, J. WUYTS<sup>2</sup>, J. MONSTREY<sup>2</sup>, J. VAN LOON<sup>1</sup>, J. GOFFIN<sup>1</sup>, C. PLETS<sup>1</sup> (<sup>1</sup>U.Z. Gasthuisberg, Leuven, <sup>2</sup>Z.O.L. Campus Sint-Jan, Genk).

*Introduction* : Patients with ankylosing spondylitis are at more risk than the general population for sustaining complex and instable fractures of the cervical spine involving both anterior and posterior elements. The precipitating traumatic event is frequently relatively minor while high rates of neurological deficit with associated mortality and morbidity are often found.

*Materials and methods* : 13 Patients and 14 fractures of the ankylosed cervical spine treated between 1989 and 2003 were retrospectively reviewed. One patient who died early due to comorbidity was excluded. Work up generally included plain radiography and computed tomography. Magnetic resonance imaging was only performed in 3 patients. Unsatisfactory clinical evolution, important radiological findings and failure of conservative treatment were arguments to perform surgery.

*Results* : There were 12 men and one woman. The mean age was 56 years (range 40-69). Most fractures occurred at the level C6-C7 after relatively minor trauma. Before treatment, 5 patients were neurologically intact, 4 had quadriplegia, 1 quadriparesis and 3 radicular symptoms. 4 Patients were treated with external immobilisation : 3 received a Halo-immobilisation and one a cervical collar. 8 Patients (9 fractures) underwent anterior fixation within days after injury. No neurological deterioration was observed neither after conservative nor after surgical treatment. In 4 patients the post-traumatic neurological deficit completely resolved : these patients were all treated with anterior fixation. Severe pneumonia occurred in 3 patients ; one of them died.

*Conclusion* : Demographic characteristics are similar to other reports in literature relative to gender, age, mechanism of injury, fracture site and neurological deficit. Confirming the data from the literature we advocate, if possible, an evaluation with MR-scan for assessing or excluding ligamentous damage and epidural hematoma. We also advocate in most cases early and aggressive treatment with either anterior or posterior internal fixation as the treatment of choice because early mobilisation is the best circumstance to avoid both spinal (malunion and neurological deterioration) and non spinal complications, namely pneumonia.

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**Osteoid osteoma and osteoblastoma of C0-C2 : management of 6 cases.** M. BRUNEAU, M. ARCHILI, B. GEORGE (Hôpital Lariboisière Paris (France)).

*Introduction* : Osteoid osteomas and osteoblastomas located in the C0-C2 area are rare and bring into discussion the management of the vertebral artery (VA) and the need for stabilization.

*Methods* : From 1990 to 2002, 6 patients, 4 males and 2 women, with a mean age of 21.2 years (3.0-38 y) were operated for lesions located in the occipital condyle (n = 1), the C1 lateral mass (n = 3) and the C2 vertebral body (n = 2). One patient was operated 9 years before in another institution. Preoperatively, all patients complained of cervicalgia (mean delay : 2.3y), 2 have reduced mobility and 2 have torticollis. Preoperatively, patients were investigated by x-rays (n = 3, sensitivity : 33.3%), CT-scan (n = 6, sensitivity : 100%), MRI (n = 2, sensitivity : 100%), osseous scintigraphy (n = 3, sensitivity : 100%) and VA angiography (n = 1).

*Results* : Five lesions were resected by an antero-lateral approach and a lesion within the C1 lateral mass by a postero-lateral approach. Exceptionally, a lesion with the typical aspect of osteoid osteoma on CT-scan was treated initially conservatively and evolved radiologically to an osteoblastoma. In all cases, the nidus was resected and osseous component was drilled up to normal bone (n = 2) or peripheral condensation (n = 4), left in place to maintain stability. In all cases, the VA was controlled. Mobilization from the C1 groove (n = 4) and opening of the transverse process of C1 (n = 3) were necessary for C0 and C1 lesions while opening of the C2 transverse process (n = 2) was performed for C2 vertebral body lesions. In two cases, the VA sheath was inflammatory. One patient needed to be reoperated for recurrence after a delay of 16 months. A patient with a postoperative infection was reoperated on the twelfth postoperative day for huge hemorrhage caused by VA rupture. No patient required fusion. After 27.6 months of mean follow-up, 5 patients were free of symptoms and one was lost.

*Conclusions* : Osteoid osteomas and osteoblastomas of the C0-C2 region can be resected safely with good outcome. Stability is preserved by drilling interruption within compact bone. VA requires special care in this area. A rare evolution of an osteoid osteoma to an osteoblastoma is also documented.

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**Intermediate follow-up after treatment of degenerative disc disease with the bryan cervical disc prosthesis : single-level and bi-level.** J. GOFFIN, F. VAN CALENBERGH, J. VAN LOON *et al.* (Department of Neurosurgery, U.Z. Gasthuisberg Leuven).

*Study Design* : Prospective, concurrently enrolled, multicenter trials of the Bryan Cervical Disc Prosthesis (Medtronic Sofamor Danek, Memphis, TN) were conducted for the treatment of patients with single-level and two-level (bi-level) degenerative disc disease of the cervical spine.

*Objectives* : The studies were designed to determine whether new functional intervertebral cervical disc prosthesis can provide relief from objective neurologic symptoms and signs, improve the patient's ability to perform activities of daily living, decrease pain, and maintain stability and segmental motion.

*Summary of Background Data* : The concept of accelerated degeneration of adjacent disc levels as a consequence of increased stress caused by interbody fusion of the cervical spine has been widely postulated. Therefore, reconstruction of a failed intervertebral disc with functional disc prosthesis should offer the same benefits as fusion while simultaneously providing motion and thereby protecting the adjacent level discs from the abnormal stresses associated with fusion.

*Methods* : Patients with symptomatic cervical radiculopathy and/or myelopathy underwent implantation with the Bryan prosthesis after a standard anterior cervical-discectomy. At scheduled follow-up periods, the effectiveness of the device was characterized by evaluating each patient's pain, neurologic function, and radiographically measured range of motion at the implanted level.

*Results* : Clinical success for both studies exceeded the study acceptance criteria of 85%. At 1-year follow-up, the flexion-extension range of motion per level averaged  $7.9 \pm 5.3$  degrees in the single-level study and  $7.4 \pm 5.1$  degrees in the bilevel study. No devices have been explanted.

*Conclusions* : Discectomy and implantation of the device alleviates neurologic symptoms and signs similar to anterior cervical discectomy and fusion. Radiographic evidence supports maintenance of motion. The procedure is safe and the patients recover quickly. At least 5 years of follow-up will be needed to assess the long-term functionality of the prosthesis and protective influence on adjacent levels.

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## Tumor Neurosurgery

**Endoscopic transnasal transsphenoidal surgery.** J. D'HAENS, K. VAN ROMPAEY, R. ATEs, L. CAVENS, C. CHASKIS (Department of Neurosurgery, A.Z. V.U.B.).

*Introduction* : Endoscopic transnasal approach has become a procedure of choice for the management of sellar lesions. We report our experience with this technique and compare the results with the microscopic procedure.

*Materials and Methods* : From september 2001 to january 2004, 49 patients underwent endoscopic transnasal surgery in our department for sellar lesions. There were 45 pituitary adenomas, 2 craniopharyngiomas, one Rathke cleft cyst and one case of histiocytosis X. Age ranged from 5 to 82 years (median 44 years). We used 4 mm rigid endoscopes with 0° and 30° angled lenses. Surgical instruments are inserted adjacent to the endoscope through the same nostril. The use of an endoscope holder allows the surgeon to use his both hands to operate. Correction of hypersecretion was obtained in 17 (85%) out of 20 cases of non invasive pituitary adenomas (13 micro and 7 macroadenomas). Among the 13 patients with visual impairment, 11 improved and the 2 others remained unchanged. Four patients underwent a second operation because of intrasellar fat graft infection (2 cases) or postoperative CSF leakage (one case after multiple previous

transsphenoidal and transcranial operations and the other one had no sellar packing). There were no permanent morbidity and no mortality.

*Discussion* : Transnasal endoscopic surgery provides a panoramic view of the surgical field and allows a good tumor resection. The patients have no nasal packing and less postoperative discomfort. The infectious complications we observed in our early experience are probably due to a contamination during the endonasal route. We currently give prophylactic antibiotics, what was not necessary in our previous experience with the submucosal microsurgical technique.

**Transsphenoidal approach with low field MRI for pituitary adenoma : experience in 31 cases.** O. DE WITTE, D. WIKLER, M. LEVIVIER, A. VANDENSTEENE, P. PANDIN, D. BALÉRIAUX, J. BROTCI (Services de Neurochirurgie, Anesthésiologie et Neuroradiologie, Hôpital Erasme ULB, Bruxelles, Belgique).

*Background* : Transsphenoidal surgery for pituitary adenoma has excellent results but there is no control on the extent of the resection during surgery. The advent of intra-operative MR (iMR) helps to evaluate adenoma resection. Here, we show our first result in the use of a low field iMRI in the transsphenoidal approach for pituitary adenoma.

*Method and Population* : Over a period of 14 months, 33 patients were operated on for a pituitary adenoma. For all of them, we planned the use of Polestar N10 low-field iMR system (0.12 Tesla). A transnasal, transsphenoidal approach was used. The patients were in prone position with the head in extension. A T1 sequence of 3.5 or 7 minutes with gadolinium injection was performed. All surgeries were done by the same surgeon. After completion of the surgery, a second set of iMR images were acquired. When a discrepancy between the findings of the surgeon and the iMRI was present, a second look was done, and new iMR images were acquired. In all cases, the last iMR sequence was compared with a post-operative control, done with a conventional MRI (1.5 Tesla).

*Results* : iMRI with Polestar was obtained in 31 patients, but it was possible to correctly center the field of view on the area of the pituitary adenoma in only 29 patients. For 2 patients, no images were obtained due to technical problem of the Polestar. In 25 cases, the MRI confirmed the surgeon's findings about the resection. In 4 cases, the surgeon thought that a complete removal of the adenoma was done but iMRI showed residual adenoma. The second look confirmed the iMRI information. A comparison between last images obtained with iMR (0.12 Tesla) and the standard post-operative images (1.5 Tesla) demonstrated the good quality and relevance of information given by the low field iMR system.

*Conclusion* : Low field iMR gives excellent information on the extent of the resection of pituitary adenoma during transsphenoidal surgery, and reduces the incidence of incomplete resection. The limit of the Polestar N10 is the size of the patient's neck (no possibility to image the sellar area when the neck is too short) and when there is an infiltration of the cavernous sinus (because of the difficulty to distinguish the residual adenoma).

**Awake surgery for tumours in speech areas : preliminary results and perspectives for the future.** S. HANCQ<sup>1,5</sup>, J. DELEVAL<sup>2</sup>, P. PANDIN<sup>3</sup>, K. NEUGROSCHL<sup>4</sup>, D. WIKLER<sup>1</sup>, O. DE WITTE<sup>1</sup> (Departments of <sup>1</sup>Neurosurgery, <sup>2</sup>Neurology, <sup>3</sup>Neuroanaesthesiology, <sup>4</sup>Neuroradiology, Erasme Hospital, Brussels ; Department of <sup>5</sup>Neurosurgery, CHU Hospital, Charleroi).

*Introduction* : The resection of tumours in the language areas remains a true challenge for the neurosurgeon. Functional Magnetic Resonance Imaging (fMRI) helps the preoperative work up but the awake surgery with intraoperative language mapping is the best way to maximize the tumour resection with minimal clinical deficits. We present our first clinical experience of the awake surgery in the resection of tumours in the language areas.

*Methods* : Since January 2002, eight patients (3F/5M) were included. Preoperative symptoms consisted in seizure for all of them, language disturbance (6 patients) and behaviour disturbance (1 patient). Tumours were located in or near the functional areas (Broca, Wernicke) for most patients (7/8) ; One patient ambidextrous presented a right temporal tumour. The awake surgery under local anaesthesia was performed with neuronavigation based on MRI (1 patient), MRI+ Pet-Scan (4 patients), MRI+ Pet-Scan+ fMRI (3 patients). Total resection was achieved in 2 patients, subtotal resection concerned 1 patient and partial resection 5 patients. The histological diagnosis was grade II glioma (2 patients), glioblastoma (2 patients), grade II oligodendroglioma (1 patient) and grade III oligodendroglioma (2 patients).

*Results* : This impressive surgery was well tolerated by all patients. In the immediate postoperative time, the tumour resection improved the language in 2 patients ; Four patients were stable (three keep a normal language before and after surgery) and only two patients were worsened (they were also the only ones to be previously operated on for the same tumour). Three months after surgery, one of these two patients recovered a normal speeching, the other one continued to be improved. All patients with preoperative refractory epilepsy were controlled postoperatively. The correlation between fMRI data and intraoperative mapping (only three patients) showed interesting discrepancy.

*Conclusions* : The awake surgery for tumours in the language areas is safe and well tolerated by the informed patients. This surgery allows maximal resection with excellent clinical results. The recent use of the fMRI confirms the disparity between fMRI and intraoperative data, needed to be study in a larger group of patients.

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**Incidence of persisting hydrocephalus after early surgical treatment in 158 consecutive posterior fossa tumors in children.** D. MORELLI, A. LUBANSU, P. VAN BOGAERT, C. FRICKX, P. DAVID, J. BROTCHE, B. PIROTTE (Departments of Neurosurgery, Neuropediatrics and PET/Cyclotron biomedical unit, ERASME Hospital, University of Brussels).

*Introduction* : Hydrocephalus is frequently associated with posterior fossa tumors (PFT) in children and is often the cause of the rapid clinical deterioration at diagnosis. An early surgical management including tumor removal and/or a ventriculocysternostomy can restore fluid circulation and avoid unnecessary shunt. However, despite a complete tumor removal or a technically successful ventriculocysternostomy, hydrocephalus may persist. The aim of the present study was to analyse retrospectively the incidence and the management of persisting hydrocephalus after early surgical management of PFT in a consecutive pediatric series.

*Methods* : Between January 1981 and January 2004, 158 consecutive PFT [cerebellum 95, brainstem 42, pineal region (PRT) 21] were referred. Tumor removal was attempted as soon as possible (within the 48 hours). An external ventricular drainage was inserted preoperatively and removed after at least 72 hours of tolerance without drainage). In tumors estimated surgically inaccessible, biopsy combined a ventriculocysternostomy. We retrospectively recorded the incidence of hydrocephalus at diagnosis and that remaining postoperatively despite tumor removal or ventriculocysternostomy.

*Results* : At diagnosis, 113/158 (72%) PFT presented with hydrocephalus (106/113 were referred not shunted ; 7 PRT were referred after being shunted in other hospitals). Subtotal or total tumor removal was achieved in the 7 PRT and shunt removal – attempted in only 4/7 – failed in 3/4 (shunted 2,4,5 months earlier<sup>1</sup>). The other 106 underwent surgery [total removal in 92, hydrocephalus cured in 82/92 (89%)<sup>2</sup> ; biopsy with ventriculocysternostomy in 14, hydrocephalus cured in 11/14 (78%)<sup>3</sup>]. Hydrocephalus persisted postoperatively in  $6^1 + 10^2 + 3^3 = 19/106$  children. Fifteen out of the 19 were symptomatic and thereafter shunted. The other 4 were asymptomatic and were therefore followed up to 24 months showing decrease of hydrocephalus. Finally, only 15/106 that presented with hydrocephalus really required a shunt (14%).

*Conclusions* : This study showed that : 1) hydrocephalus was associated with PFT in 72% at diagnosis ; 2) shunt-dependence was observed early after initial unnecessary shunt insertion in PRT ; 3) the early surgical management of the tumor and of the hydrocephalus, including ventriculocysternostomy allowed to cure hydrocephalus in 86% of the cases, 4) finally, 14% of PFT actually required a shunt despite accurate neurosurgical management.

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**Quality assessment of treatment of patients with glioblastoma at the university hospital Leuven.** F. VAN CALENBERGH, C. A. SMETS, S. DE VLEESCHOUWER, J. VAN LOON, B. NUTTIN, J. GOFFIN, J. MENTEN<sup>1</sup>, C. PLETS (Department of Neurosurgery and Oncology<sup>1</sup>, U.Z.Gasthuisberg, Leuven).

*Introduction* : Glioblastoma multiforme (GBM) is the most common malignant primary brain tumor. There are no class-I evidence guidelines to direct treatment, but there is a clear consensus that surgery and adjuvant radiotherapy is the standard of care. There are indications that aggressive multimodality treatment with some form of chemotherapy, interstitial irradiation, and more experimental regimens may be associated with improved outcome. We have conducted a review of the patients treated at our institution, studying not only outcome, but also comparing actual treatment with known guidelines.

*Material and methods* : A consecutive series of 147 patients with GBM treated between 1996 and 2001 was retrospectively reviewed. When the final outcome was not documented, the general physicians were contacted to determine any treatment given after the patient left our hospital, and to determine date of death or functional status.

*Results* : Of the 147 patients, in 38 no histology was obtained and the diagnosis was only based on imaging. There were 88 men and 59 women, with ages from 19 to 92. Resection was complete in 44, subtotal in 35, partial in 10, and biopsy only in 20. Operative mortality was 1%. Radiotherapy was performed in patients with Karnofsky scores of 70 or higher. In most, approx. 58 Gy was given in 30 fractions. However, 14% received lower doses (36 Gy). More experimental initial treatments included local chemotherapy in 7, interstitial irradiation in 2, chemotherapy in 2. Confirming the data from the literature, younger age, complete resection and a full course of radiotherapy were associated with longer survival. Progression occurred in 21% within 3 months and in 25% in the next 3 months.

*Conclusion* : Although the standard of care, complete resection followed by fractionated radiotherapy, is the guideline in our Department, only 1 in 4 patients is able to receive this “optimal” treatment. Tumor invasion in eloquent areas, poor Karnofsky status, and other patient related factors limit the indiscriminate application of the guidelines. These same fac-

tors probably lead to selection bias in experimental and industry-sponsored studies of new treatment regimens, and should be disclosed by the authors.

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## POSTERS

### **Paraclinoid and cavernous sinus regions : measurement of critical structures relevant for surgical procedure.**

F. COLLIGNON, M. LINK (Centre Neurochirurgical Clinique du Parc Leopold de Bruxelles, Department of Neurological Surgery - Mayo Clinic Rochester (MN)).

*Objective* : Determination of the safest distance the falciform ligament can be incised from its origin to the orbital apex. Measurement of the distance between the oculomotor foramen and the IV nerve in the lateral wall of the cavernous sinus. Evaluation of the optic strut as an accurate landmark between the intradural (subarachnoid) and extradural segment of the internal carotid artery (ICA).

*Methods* : Ten fixed human cadaver heads were examined for a total of twenty sides. A frontotemporal craniotomy, an orbito-optic osteotomy and extradural anterior clinoidectomy were performed followed by opening the falciform ligament, circumferentially releasing the distal dural ring and dissection of the lateral wall of the cavernous sinus under the operating microscope. We measured : 1) the distance between the entry of the III nerve and the point where the IV nerve crosses over it into the cavernous sinus. 2) The distance the falciform ligament can be incised along the optic nerve laterally until the IV nerve is encountered at the orbital apex. 3) The distance between the optic strut and the lateral part of the distal dural ring. 4) The distance between the optic strut and the ophthalmic artery. All measurements were made in millimeters, using small calipers.

*Observation* : The distance between the optic strut and the lateral part of the distal dural ring ranges from 3 to 7.5 mm (mean 4.2 mm). In all our specimens, the ophthalmic artery was found distally from the optic strut in the intradural space at a distance ranging from 0.5 to 7 mm (mean 3.35 mm). The distance between the entry of the third nerve and the IV nerve into the cavernous sinus ranged from 7 to 15 mm (mean 10.9 mm). The distance between the origin of the falciform ligament and the IV nerve at the level of the orbital apex ranged from 9 to 15mm (mean 10.75 mm).

*Conclusion* : The falciform ligament and the optic sheath should not be opened longer than 9 mm along the lateral optic nerve or injury to the IV nerve can occur. Starting at the oculomotor foramen, the opening of the cavernous sinus should be limited to 7 mm to avoid injuring the IV nerve. Finally, the optic strut can be a reliable bony landmark that separates the subarachnoid space and extradural compartments along the anterior and medial ICA.

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### **Bilateral carotid-cavernous fistula : a case report with review of literature.** C. DANIEL<sup>1</sup>, G. MILBOUW<sup>1</sup>, P. GOFFETTE<sup>2</sup>

Carotid-cavernous fistula (CCF) is an occasional consequence of head trauma. Ordinary it's a consequence of severe trauma and the first sign is pulsatile exophthalmia.

We reported the case of a 84 years old woman admitting after a minimal head trauma. 8 days after the injury, she developed an isolated right third cranial nerve palsy. The radiological exploration revealed a bilateral CCF. After embolization of the right fistula, a typical presentation of CCF appeared on the left side with progressive exophthalmia and chemosis. A second session of embolization was planned but unfortunately, patient died from an intracerebral hemorrhage the previous day. The cardinal manifestations of CCF are pulsatile exophthalmia, chemosis and cranial bruit. Other symptoms that have been described in the literature include visual disturbance, ophthalmoplegia, and occasionally epistaxis.

Intracranial hemorrhage caused by CCF is quite rare. Bilateral CCF is exceptional. The treatment consist in balloon embolization. Prognosis is ordinary good.

Our case is interesting by the original presentation and its dramatic unusual evolution (a few cases in the literature).

CCF must be suspected when ocular symptoms occurs after head trauma, even benign, particularly in elderly.

Endovascular treatment is actually the standard. When partial, it must be know that pejorative evolution with intracerebral hemorrhage can occur.

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### **Adhesion prevention in lumbar disc herniation with oxiplex gel. A comparative study with AdconL.** A. DE MEEUS, P. FRANSEN, F. COLLIGNON (Department of Neurosurgery, Clinique du Parc Léopold Brussels).

*Introduction* : Peridural fibrosis is one of the causes of «failed back surgery syndrome», when excessive scar tissue causes impairment in function, compression or pain by tethering of nervous tissue to surrounding muscle or bone. This

condition creates not only painful but also expensive patients due to productivity losses and further therapeutic measures. The use of fibrosis inhibitors could therefore increase the success rate of surgery, decrease the need for reoperations and create direct and indirect savings.

*Methods* : We compared a series of 62 patients suffering from one level disc herniation treated with AdconL with another similar series of 20 patients treated with CaCl<sub>2</sub> + NaCl + Na Carboxymethyl cellulose + polyethylene oxide (Oxiplex).

*Results* : When compared, Oxiplex showed a 100% synthetic composition without any animal gelatine as featured by AdconL. Although both expensive, cost compared favourably for Oxiplex. Three patients treated with AdconL showed painful erysipeloïd like cutaneous reaction. Two patients needed unexpected reoperations, one for a non CSF sterile fluid collection. No product related complication has been observed with Oxiplex so far. Significant fibrosis reduction was observed on AdconL treated patient requiring reoperations for recurrence (2 patients).

*Conclusions* : Oxiplex represents a safe, cheaper alternative to achieve fibrosis reduction in lumbar disc surgery and has so far not presented any of the side effects observed with AdconL. Perfect surgery and adequate decompression remain however the most important item in "failed back" prevention.

**The transoral approach : indications and surgical technique.** L. F. DE WAELE, G. ALESSI, B. D'HAEN, B. NOENS, H. COLLE (Department of Neurosurgery, A.Z. St. Lucas Ghent).

*Introduction* : The anterior brainstem and the vertebrobasilar junction are involved in a number of neurosurgical disorders, such as extra-axial and intrinsic tumors, aneurysms, vascular malformations, and odontoid lesions due to rheumatoid arthritis or compression fractures. Managing these lesions situated in the anterior aspect of the cranio-vertebral junction (CVJ) remains a challenging neurosurgical problem. For this reason they have long been considered a "no-man's land". The transoral approach offers an excellent solution to this problem. The major advantage of this technique is the direct, wide, anterior craniocaudal exposure from the clivus down to the third vertebral body. In addition, recent technical advances, as well as refinements in microsurgical techniques, have resulted in a safe, efficient surgical procedure.

*Methods and Results* : Several cases operated by the author are highlighted to illustrate the broad spectrum of pathologies which can be treated by this approach. Patients are placed supine with head in mild extension in the Mayfield headrest. To optimize exposure of the posterior pharyngeal wall and to avoid tracheostomy, the uvula and soft palate were retracted upward and laterally into the nasopharynx, with the use of a Spetzler-Sonntag retractor. A stiff tracheal tube is used, to avoid compression during surgery. Anatomically, the most physiological and shortest route to the anterior surface of the brainstem is represented by an approach performed through the pharynx and the underlying clival bone. Midline incision of the pharyngeal mucosa and removal of the underlying bone structures offer a direct view of the anterior brainstem and vertebrobasilar junction.

Indications and contra-indications for this surgery, anatomy of the CVJ region, technical pearls and possible intra-operative problems are discussed.

*Conclusion* : The transoral approach is an effective approach for giving access to ventrally located abnormalities of the clivus and craniovertebral junction without requiring dislocation or manipulation of any cerebral or vascular structure. Technical and anatomic awareness to deal with these challenging anatomic structures are mandatory.

**Intradural endoscopic closure of dural breaches in a case of posttraumatic tension pneumocephalus.** F. DEWAELE, D. VAN ROOST, J. CAEMAERT (Department of Neurosurgery, Ghent University Hospital).

*Introduction* : Posttraumatic tension pneumocephalus can become a life-threatening condition that urges to repair the causal breach in the dura of the skull base. The established procedures for this purpose are craniotomy followed by either an intra- or extradural approach, and the transnasal endoscopic approach. Dural repair via craniotomy in aged patients may be jeopardized by the fragility of the dura and by its firm adhesions to the bone. Transnasal sealing requires the opening of each of the paranasal sinuses or cells that line the frontal base. We present the case of a 92-year-old man, in whom an alternative, minimally invasive procedure was chosen. The patient was in a poor general condition and suffered from progressive obtundation till coma, because of a massive tension pneumocephalus, that was not reversed by drainage of the intracranial air via a burr hole, but even increased instead.

*Methods* : Through the existing burr hole at the coronal suture, a rigid endoscope was introduced and passed in front of the repelled brain to visualize the dural defects of the frontal skull base at the level of the ethmoidal roof. Pericranium, harvested from around the burr hole, was taken to be glued endoscopically against the defects. The procedure was repeated at the contralateral side. The drainage was removed.

*Results* : After surgery, a gradual decrease of the amount of intracranial air was documented. The patient regained consciousness, could be weaned from the ventilator and was extubated. In spite of this favorable course, he suddenly

died two weeks after surgery from combined pulmonary and renal dysfunction. Autopsy documented, however, the efficacious sealing of the skull base.

*Conclusions* : Intradural endoscopic closure of dural breaches at the frontal skull base was rendered possible by a massive backward compression of the brain in this case of tension pneumocephalus and it turned out to be efficacious. In the given circumstances, it was the least invasive procedure for this purpose.

**<sup>18</sup>F-tyrosine PET in neurooncology : an alternative to <sup>11</sup>C-methionine ?** B. KASCHTEN, C. LEMAIRE, A. LUXEN, R. HUSTINX, A. STEVENAERT (C.H.U. Liege).

*Objectives* : To evaluate the usefulness of <sup>18</sup>F-tyrosine PET (in combination with <sup>18</sup>F-FDG PET) as an alternative to <sup>11</sup>C-methionine, for the evaluation of brain tumors.

*Methods* : Since 2001, we performed 63 PET examinations with <sup>18</sup>F-tyrosine. In 35 cases, this was combined with a <sup>18</sup>F-FDG PET within a few days.

Indications for PET examinations were as follows :

- pre-operative evaluation : 19 cases
- follow-up of low-grade gliomas : 12 cases
- differential diagnosis between recurrence and radiation necrosis : 22 cases
- routine controls during or after treatment : 8 cases
- miscellaneous : 2 cases

Definite diagnosis was available in 27 cases, based on recent pathological examination (n = 15) or on 6-months minimum follow-up (n = 12).

Regions of interest were drawn over the lesion and the contralateral cortex, in order to calculate a tumor to cortex ratio (T/C ratio).

*Results* : Our first results demonstrate that :

1 - <sup>18</sup>F-tyrosine PET is better than <sup>18</sup>F-FDG PET in the delineation of brain tumors, especially low-grade gliomas (low grade gliomas present as hypometabolic on <sup>18</sup>F-FDG PET in 9 of 10 cases, and hypermetabolic on <sup>18</sup>F-tyrosine PET in 12 of 13 cases)

2 - The uptake of <sup>18</sup>F-tyrosine increases with histological grade : in low-grade astrocytomas, T/C ratio range between 1.0 and 2.4, in high grade astrocytomas between 1.8 and 2.6.

3 - Oligodendrogliomas exhibit a high uptake of <sup>18</sup>F-tyrosine (like <sup>11</sup>C-methionine), not correlated to histological malignancy (T/C ratio between 2.0 and 3.5 in low-grade, between 1.5 and 3.7 in high grade oligodendrogliomas).

4 - <sup>18</sup>F-tyrosine PET is superior to <sup>18</sup>F-FDG PET in the delineation and demonstration of tumor recurrences (18/18 recurrences clearly depicted by <sup>18</sup>F-tyrosine, only 6/11 visible on <sup>18</sup>F-FDG PET).

*Conclusions* : <sup>18</sup>F-tyrosine, in neurooncology, seems to exhibit the same behaviour as <sup>11</sup>C-methionine, and to have very similar uptake levels, compared to the histological grade. Considering the longer half-life of fluor-18, <sup>18</sup>F-tyrosine seems a very useful and easy to handle alternative for the evaluation of amino acids metabolism in brain tumors.

**Dysplasia epiphysialis hemimelica of the upper cervical spine : a case report.** G. KESTELOOT<sup>1</sup>, P. VAN SCHAEYBROECK<sup>1</sup>, P. DELAERE<sup>2</sup>, L. LATEUR<sup>3</sup>, C. PLETS<sup>1</sup>, J. VAN LOON<sup>1</sup> (Department of Neurosurgery<sup>1</sup>, Department of Otorhinolaryngology<sup>2</sup>, Department of Radiology<sup>3</sup>, University Hospital Leuven).

*Introduction* : Dysplasia epiphysialis hemimelica or Trevor's disease is a rare developmental bone dysplasia by an osteocartilaginous tumour arising from the epiphysis. In this case report, a rare case of dysplasia epiphysialis hemimelica of the C1-C2 facet joint extending to the retropharyngeal space is presented.

*Case report* : This thirty five year old male patient was diagnosed ten years ago with a retropharyngeal mass lesion, but at that time no treatment was performed. Because of a progressive increase in volume he was referred for treatment. CT showed a osteocartilaginous overgrowth at the right C1-C2 facet joint with important anterior displacement of the pharynx. Presenting symptoms were limited to cervical pain and a cracking feeling provoked by movements of the neck. The lesion was resected by a transoral parapharyngeal approach with mandibular osteotomy, with the aid of neuro-navigation (Stealthstation Treon). A small isolated part was left in place because of adhesion to the vertebral artery. Histopathologically the lesion consisted of a mixture of cartilaginous and trabecular bone (comparable to osteochondroma). A postoperative infection of the sublingual area was treated with antibiotics. There was a complete remission of the preoperative complaints, and follow up showed no recurrence of the lesion at 1 year.

*Discussion* : Dysplasia epiphysialis hemimelica is a rare developmental disorder of epiphysal osteocartilaginous growth, usually of the lower limbs. The lesions are benign, but may cause pain due to mass effect and impairment of the

mobility of the joint. Although histologically it may look like an osteochondroma, it is not a neoplasm, and it arises from the epiphysis, whereas an osteochondroma arises from the metaphysis or diaphysis. The diagnosis depends on radiological features (osteocartilaginous mass with focal ossification centers arising from the epiphysis with involvement of the articular surface) and histopathology. Until now only one spinal (thoracic) localisation was described in a patient with multiple lesions in the limbs. To our knowledge this is the first case of Trevor's disease of the cervical spine.

*Conclusion* : Dysplasia epiphysealis hemimelica (Trevor's Disease) has to be considered in the differential diagnosis of osseous mass lesions of the cervical spine.

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**Positron emission tomography (PET) with 11C-methionine in brain gliomas : outcome of patients and impact of treatments on metabolic information.** J. MASUDI, S. GOLDMAN, D. BALERIAUX, M. LEVIVIER, B. PIROTTE, J. BROTCHE, O. DEWITTE (Departments of Neurosurgery and PET/Cyclotron biomedical unit, ERASME Hospital, University of Brussels).

*Introduction* : PET using the radiotracer 11C-methionine (PET-MET) is of interest in the management of brain gliomas, as it provides metabolic information related to histologic grade, types of glioma, and outcome of the patients. The purpose of this retrospective study is to evaluate the impact of standard applied treatments (surgery, radiotherapy, and chemotherapy) on PET metabolic information.

*Methods* : Twenty-six patients with a brain glioma have had one PET-MET examination before and after each treatment modality, and were followed for their outcome. PET-MET images have been evaluated using a visual scale. The applied treatments were surgery, radiotherapy, and/or chemotherapy. PET-MET was obtained before and after treatment, and the relationship between decreased or increased metabolism has been evaluated with respect of the free interval (time between treatment and recurrence).

*Results* : We observed a positive effect (decrease of metabolism) of surgery, radiotherapy, chemotherapy on PET-MET, which was systematically associated with an improvement in the Karnofsky performance score. The decrease in MET metabolism after treatment was statistically correlated with an increase in free interval ( $p = 0.0002$ ).

*Conclusion* : A strong uptake of MET is known to be correlated to a shorter survival and therefore PET-MET represents a prognostic factor in gliomas. Here, we found that the applied treatments have an impact on MET metabolism in gliomas. When MET uptake is decreased after treatment, we observed a significant increase in the free interval. In patients with gliomas, PET-MET can be used, not only as a prognostic factor at the time of diagnosis, but also to evaluate the response to treatments.

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**Unusual long term survival of glioblastoma multiform after multimodal therapy : a case report.** G. MILBOUW, C. DANIEL, A. MICHOTTE, J. P. HERMANNE

Glioblastoma multiform is the most common primary brain tumor and the most malignant astrocytoma (WHO grade IV). These tumors cannot be cured by surgery, and so the goal should be to prolong quality of life. Cytoreductive surgery followed by external radiation therapy and chemotherapy has become the standard treatment.

We reported the case of a 42 years old man admitted for "severe depression" and suffering from a fronto-callosal-frontal glioblastoma ("butterfly glioblastoma"). Diagnosis was made after stereotactic biopsy. He was only treated by radiotherapy (60 Gy) and chemotherapy (BCNU) and temozolomide during 1 year. The clinical and radiological evolutions were remarkable : after 3 years Karnofsky score is 100 and patient has full professional activity. MRI study show a marked regression with absence of enhancement and PET scan show no hypermetabolism.

Three independent factors seem to affect longevity :

- patient age (younger patients faring better)
- histological features
- performance status at presentation (Karnofsky score).

Therefore, the following are usually not candidates for surgery :

- extensive dominant lobe glioblastoma
- lesion with significant bilateral involvement ("butterfly glioblastoma")
- elderly patient
- patients with poor Karnofsky scores

At the other side, partial resection of glioblastoma carries significant risk of post-operative hemorrhage and/or oedema with risk of herniation.

In general, with optimal treatment the median survival for glioblastoma is < 1 year.



Large and bilateral glioblastoma were considered as untreatable with very bad prognosis. In some cases, radiotherapy followed by long term chemotherapy can give good results and have to be considered for young patients.

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**Subependymoma of the fourth ventricle : a case report.** B. NOENS, G. ALESSI, B. D'HAEN, H. COLLE, L. DE WAELE (Departement of Neurosurgery, A.Z. St. Lucas, Ghent).

*Introduction* : Subependymomas are rare intracerebral neoplasms. The incidence is estimated between 0,2 and 0,7% of all cranial tumors. It is thought that they originate from tanocytes which are cells that span the pial en ependymal layers. This is the reason why their predilection place is the ventricular system, rarely the spinal cord and the filum terminale. To our knowledge only sixty cases of symptomatic fourth ventricular subependymoma are described in literature, of which merely fifty percent in radiological series.

*Methods* : We present a 53-year old male patient complaining of progressively worsening gait disturbance since one year. His wife mentions also an obstructive respiration and increasing snoring during sleep. A CT scan revealed a solid, non contrast-enhanced, heterogenously calcified tumor three centimetres in diameter filling the cisterna magna. MRI showed a discrete gadolinium enhancement with extension of the tumor in the floor of the fourth ventricle, extruding the right foramen of Luschka compressing the mixed cranial nerves and reaching the foramen magnum. A midline posterior fossa craniectomy with resection of the posterior arch of C1 was performed. During dissection a very clear demarcation between the solid greyish partially calcified tumor and the cerebellar hemispheres and the brainstem was found. The most deeply seated part was located in the left inferomedial triangle of the floor of the fourth ventricle. During ultrasonic aspiration of this part a transitory arterial hypertension was detected.

*Results* : The postoperative MRI confirmed the intraoperative completeness of the resection. The initial hoarseness, dysphagia, gastro-intestinal dysfunction and orthostatism related to the manipulation of the nuclei of the vagal en glossopharyngeal nerves, completely recovered after several weeks. There was need for a temporary tracheostomy and percutaneous gastrostomy. Histological examination confirmed the diagnosis of subependymoma.

*Conclusion* : Subependymoma should be included in the differential diagnosis of a posterior fossa mass lesion. Due to the slow growing of this tumor, symptoms could be insidious or even absent. Therefore these lesions are frequently diagnosed at autopsy. Since the prognosis is determined by the completeness of the excision, this should be the goal during surgery. The clear anatomical margins make it possible to obtain this goal while preserving the integrity of the brainstem. An initial neurological deficit does not need to result in a permanent dysfunction but should direct to an adequate and immediate rehabilitation program including tracheostomy and gastrostomy if needed.

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**Visual disturbances caused by herniation of the infundibular recess in primary empty sella syndrome.** D. PEUSKENS, J. WUYTS, G. VERSWIJVEL, J. VANDEVENNE, J. MONSTREY (Department of Neurosurgery, Ziekenhuis Oost-Limburg, Genk).

*Introduction* : Visual loss caused by primary empty sella syndrome is an infrequent symptom that is caused by herniation of the visual system in the pituitary fossa. We describe a patient experiencing fast progressive visual loss without obvious herniation of the visual system but with herniation of the infundibular recess who was successfully treated with extradural obliteration of the pituitary fossa.

*Materials and Methods* : A 40-year old male patient presented in our hospital with progressive visual loss. Further investigation revealed a herniation of the infundibular recess in the pituitary fossa secondary to primary empty sella syndrome. However, no obvious herniation or torsion of the optic chiasm was remarked. Subsequently, our patient was treated by a combined extradural transsphenoidal and a standard subfrontal intradural approach in order to obliterate the pituitary fossa with muscle grafts while controlling the reposition of the midline structures under direct vision.

*Results* : During the operation a marked herniation of the infundibular recess was noted together with atrophy of the optic nerves and chiasm. Postoperatively, our patient remarked a subjective improvement, ophthalmologic control revealed that further deterioration occurred was halted.

*Conclusions* : For patients with visual loss caused by herniation of the visual system secondary to an empty sella syndrome surgical therapy is widely accepted. In case of no visible herniation however, the indication is more unclear. Our case report shows that in patients with anatomical deformity of only the anterior third ventricle traction on the visual system can exist. Visual deterioration can be halted in these patients with surgical obliteration of the pituitary fossa through a transsphenoidal approach.

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**Strict application of sterile technique for shunt placement reduces the shunt infection rate in children : a prospective series of 46 consecutive procedures.** B. PIROTTE, A. LUBANSU, D. MORELLI, N. MASSAGER, F. LEFRANC, S. HANCQ, N. OULAD BEN TAIB, A. VANDESTEENE, J. BROTCHE (Department of Neurosurgery, ERASME Hospital, University of Brussels).

*Introduction* : In neurosurgical practice, shunt infection may have devastating consequences, especially in young children. Microbial colonies have already fixed to the implanted materials during the shunt placement procedure (SP) even when we apply a skillful surgical technique. We evaluated whether the rigid application of a technique of SP aimed at the eradication of postoperative shunt infection. We present the preliminary data of a prospective protocol applied in our department.

*Methods* : During the 2001-2003 interval (36-month-period), 40 consecutive children (19F/21M ; 21 aged < 1 year ; 19 between 1 and 10 years) with symptomatic hydrocephalus (Secondary to tumor 12, ventricular haemorrhage 12, non-infectious obstruction 6, meningitis 3, trauma 2, open myelomeningocele 2, Idiopathic 2, Arachnoid cyst 1) underwent placement of a ventriculoperitoneal shunt (Delta Valve). Six children were re-operated for shunt revision. All shunt procedures (n = 46) were performed (n = 43) or closely supervised (n = 3) by the senior author (BP). The protocol included intravenous peri-operative antibiotics, avoidance of preoperative hair shaving and exposition of implants, scheduling operation in the morning, keeping doors closed and operating staff minimal, rigid adherence to classical aseptic technique, avoidance of hematomas and operative duration < 30 minutes.

*Results* : In all cases, the procedure could be scheduled as first operative case within the 3 days. However, in the group requiring a procedure in emergency (21/46), only 14/21 could be scheduled as first operative case the day after. The strict application of the protocol was the main obstacle encountered. Technical recommendations were better followed by the surgical team (surgery < 30 minutes) than by the other staff members (23/46 procedures performed with 5 or 6 persons in the operating room ; doors opening during surgery in 16/46). Only one infection occurred, 6 months postoperatively, secondary to appendicitis with peritonitis. The infecting *Streptococcus faecalis* appeared to ascend from the abdominal cavity and the fluid in the valve remained sterile. After peritonitis was cured, shunt reinsertion did lead to further infection.

*Conclusion* : This study shows that, although difficult to apply in routine, a rigidly applied protocol and strict adherence to sterile technique can reduce shunt infections to a very low level.

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**Correlation of post-mortem 9.4 tesla high resolution magnetic resonance imaging and immunohistopathology seven months after human spinal cord injury.** F. SCHOLTES, P. ADRIAENSSENS, L. STORME, A. BUSS, J. GELAN, B. KAKULAS, E. BEULS, J. SCHOENEN, G. BROOK, D. MARTIN (Department of Neurosurgery, University Hospital, University of Liege).

Magnetic resonance imaging (MRI) is currently the only imaging technique which provides useful information on the spinal cord parenchyma after trauma. Clinical MRI only allows an approximate estimation of the severity of a spinal cord lesion and its consequences in remote areas because of its low resolution. However, MRI technology is rapidly evolving, and high field scanners are being tested for clinical application. The present post-mortem investigation correlates high resolution MRI (9.4 tesla) with immunohistopathology following traumatic human spinal cord injury. The precise relation between MRI and the immunohistochemical demonstration of Wallerian degeneration, reactive astrogliosis and phagocytic macrophages is described. The findings open several perspectives. In the clinic, high resolution MRI will allow better assessment and follow-up, providing "dynamic virtual pathology" of the primary injury, as well as its consequences in areas remote from the lesion. Furthermore, high resolution MRI can be used to guide and monitor the application of existing and future therapeutic intervention strategies for spinal cord injury by providing precise localization and characterization of the tissue damage.

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**Multifocal malignant choroid plexus papilloma : a case report and review of the literature.** M. SCHOLSEM, A. STEVENAERT, M. DEPREZ, P. ROBE (Departments of Neurological Surgery and Neuropathology, University Hospital of Liège).

A 59-year old Caucasian female with a six years history of shunted normal pressure hydrocephalus was admitted to our institution with vomiting, a loss of visual acuity and a Parinaud syndrome.

CT-scan and MRI studies did not evidence any shunt malfunction but revealed three ventricular tumors located in both lateral ventricles and in the fourth ventricle. All tumors were slightly hypointense on T1-weighted MR images and showed a heterogeneous gadolinium contrast enhancement.

An uneventful complete surgical resection of fourth ventricle tumor was performed and notably improved the symptoms. Pathological findings were those of the rare mucin-secreting choroid plexus papillomas.

A rapid progression of the right lateral ventricle tumor led to its complete surgical resection eight months later. There was also evidence of a small recurrence of the fourth ventricular tumor that was left to follow-up.

Microscopical analysis of the lesion this time revealed a mucin-secreting choroid plexus papilloma numerous mitotic figures.

A total body <sup>18</sup>F-DG-PET scan was performed and ruled out a carcinomatous dissemination. A cranial <sup>18</sup>F-DG-PET scan did not reveal any hyperfixation of the contralateral ventricular tumor and of the fourth ventricle recurrent tumor. Spinal MRI did not evidence any drop metastasis.

Given the rapid progression of the lesions and the malignant nature of the second tumor, a craniospinal irradiation has been undertaken.

Papillomas of choroid plexus are rare, accounting for approximately 0,5-0,6% of primary brain tumors in adults. Their pathology, clinical features and treatment options are reviewed, with an emphasis on the 'malignant' forms of these tumors.

**Intra-canal spinal pseudomeningocele following lumbar surgery.** V. SCORDIDIS, P. THYS, C. IDE, E. URBAIN (Department of Neuroscience and Neuroradiology, Clinique Reine Fabiola, Montignies-sur-Sambre).

*Introduction* : Unintended «incidental» durotomy during lumbar surgery is a complication that varies between 0.9 and 5%. This risk is increased in re-do operations. This complication can lead to pseudomeningoceles that usually occur in the operative site. We present two cases of contained pseudomeningoceles, developing in the spinal canal, after lumbar surgery. To our knowledge, this situation has not been reported in the literature.

*Case reports* : In February 1999, a 44 year-old man was operated on for a left posterolateral L4-L5 herniated nucleus pulposus. The surgery consisted of a classic posterior interlaminar approach, herniated disc removal and microdissectomy using microscope. No CSF leak was noticed during surgery. After a few days, the patient started complaining of postural headaches and presented a pyramidal syndrome in the lower limbs. A cervicothoracic scan showed a hypodense non-enhancing fluid collection from C1 to TH1, anterior to the spinal cord, evocating a CSF collection. The patient was treated conservatively by Trendelenbourg positioning and hypervolemia. The MRI performed the next day was normal. Patient recovered completely in 24 hours. The second case is a 69 year-old man which suffered a double level spinal stenosis. In April 2003, lumbar laminectomy was performed to decompress L3-L4 and L4-L5 levels, using microscope. A small needle-like left lateral superior dural tear was noticed during surgery and packed with gelfoam. Two days after surgery, when the patient started walking, he complained of left leg pain. Neurological examination remained normal. As the pain subsisted one week after surgery, MRI was performed and showed an intra-canal posterior CSF collection extending cranially to TH7. Patient was treated conservatively and recovered.

*Discussion* : As intra-canal pseudomeningocele have not been reported, we discuss the possible mechanisms of occurrence, diagnosis and management in our cases.

*Conclusion* : Intra-canal pseudomeningocele is a very rare complication of lumbar surgery for herniated nucleus pulposus or spinal stenosis. This can occur even if there is not an identified peroperative dural tear. An unexpected complain following surgery must lead to perform a postoperative Ct scan or MRI. Conservative therapy is sufficient when no significant neurological disturbances are noticed.

**Evolutionary disease of Lhermitte-Duclos : case report and review of the literature.** A. STATHOPOULOS<sup>1</sup>, J. ENELLE<sup>1</sup>, M. DEPPEZ<sup>2</sup>, A. STEVENAERT<sup>1</sup> (Department of Neurosurgery<sup>1</sup>, Department of neuropathology<sup>2</sup>, CHU Sart-Tilman, Liege).

*Summary* : We describe an original case of a recurrent disease of Lhermitte-Duclos associated with the appearance of a new mass in the contralateral cerebellar hemisphere.

*Clinical presentation* : A 23-year-old woman, presenting with a left cerebellar syndrome and signs of raised intracranial pressure was admitted to our department. Lhermitte-Duclos disease of the left cerebellar hemisphere was suggested by both the CT-scan and the MRI images. The right cerebellum was completely normal. A partial resection was realised with a good clinical result. The postoperative exams show residue. No modification is observed during the next years. Eight years later, a new MRI study shows an increase in volume of the residue in the left cerebellar hemisphere. A new mass, of the same aspect, is observed in the right cerebellar hemisphere. Both lesions were operated on, under neuronavigational control, in two separated sessions with a good result. Postoperative control of MRT shows the almost complete resection of the masses. Histological analysis confirms the diagnosis of Lhermitte-Duclos disease without modifications with regard to the data previously observed.

*Discussion* : the authors discuss the case on clinical, radiological and anatomopathological points of view while making a review of the literature.

*Conclusion* : There may be some rare cases of recurrent Lhermitte-Duclos disease, constituting a true evolutionary neoplasm whose only treatment is surgery.

**Traitement endoscopique de kystes arachnoïdiens intraventriculaires a propos de 2 cas.** M. TRIFFAUX, V. MARNEFFE (Clinique St. Jean Bruxelles, Clinique St. Pierre Ottignies).

*Introduction* : les kystes arachnoïdiens intraventriculaires sont une entité rare dont l'étiopathogénie de leur localisation discutée, rejoint celle évoquée pour les méningiomes intraventriculaires. Lorsqu'ils deviennent symptomatiques différents traitements chirurgicaux sont proposés : fenestration, excision, shunt, radiothérapie intracavitaire. Les techniques neuroendoscopiques actuelles permettent un traitement aussi efficace et fiable que la chirurgie conventionnelle tout en étant moins invasive et moins morbide.

*Cas cliniques* : nous rapportons et illustrons (vidéo) 2 cas symptomatiques de kystes arachnoïdiens multicloisonnés chez l'adulte. Le premier de localisation lenticulaire gauche chez une femme de 39 ans est responsable de troubles objectifs de l'équilibre et de céphalées associé à une hydrocéphalie. Le second est localisé au niveau du carrefour gauche chez une femme de 74 ans et est responsable d'une hémiparésie spastique droite évolutive. Une fenestration des kystes avec mise en communication au système ventriculaire a été réalisée par endoscopie guidée par neuronavigation. Une ventriculocisternostomie a été associée dans le premier cas. Le caractère arachnoïdien a été confirmé par les différents biopsies. L'évolution clinique et radiologique est à court terme (6 mois) satisfaisante.

*Conclusions* : le traitement endoscopique guidé par neuronavigation est efficace et diminue la morbidité par sa qualité peu invasive. Cependant un suivi radio-clinique reste indispensable pour ce type de lésion vu le recul de 6 mois actuel de notre série et la description anatomoclinique toujours peu connue pour ce type de kystes arachnoïdiens.

**Minimal invasive transforaminal lumbar interbody fusion (TLIF), our preliminary experience.** A. TYBERGHEN, M. ALLAOUI, G. ABI LAHOUD, P. BOURGEOIS, R. ASSAKER (Department of Neurosurgery CHRU Lille (France)).

*Introduction* : The principle of circumferential arthrodesis has proven to guarantee optimal long-term results for the treatment of lumbar instability. Posterior, or transforaminal lumbar interbody fusion (PLIF or TLIF), are currently used for circumferential lumbar fusion with different approaches. TLIF offers the advantage to perform an interbody fusion using a unilateral access. We present a minimal invasive technique for TLIF and our personal experience with this preliminary treatment option.

*Methods* : As a first step, 2 pedicle screws are positioned at the contralateral side using percutaneous transmuscular access guided by biplanar fluoroscopy. Then a transmuscular access to the ipsilateral facet joint is made using sequential dilating devices and positioning of an X-tube™ distractor. A complete facetectomy is performed exposing the foraminal structures. After complete transforaminal discectomy the intersomatic space is distracted using a ipsilateral intersomatic tool. Distraction is maintained by the contralateral percutaneous pedicle screws using the percutaneous Sextant™ rod insertion system. This guarantees optimal disc access for preparation of the adjacent vertebral body endplates. Autologous cancellous bone harvested from the iliac crest, or intersomatic implants are inserted into the disc space. As a final step, ipsilateral pedicle screw and rod placement is performed using the same transmuscular access used for the transforaminal procedure.

*Results* : In our service, three patients with degenerative or lytic spondylolisthesis with low-back pain and/or unilateral radiculalgia were treated with this technique. We noted no per- or postoperative complications. Clinical and radiological short-term results were promising. Operation time was similar to classical fusion techniques.

*Conclusion* : Compared to classical lumbar fusion techniques TLIF seems to be a safe alternative with minimal approach-related morbidity. Effectiveness is illustrated in sporadic cases, but needs confirmation in prospective long-term studies.

**Intramedullary melanocytoma associated with syringobulbia.** R. VAN PAESSCHEN<sup>1</sup>, F. VAN CALENBERGH<sup>1</sup>, P. DEMAEREL<sup>2</sup>, R. SCIOT<sup>3</sup> (Department of Neurosurgery<sup>1</sup>, Department of Radiology, Department of Pathology<sup>3</sup> University Hospital Gasthuisberg Leuven).

*Background* : Melanocytic tumours of the central nervous system are rare and usually consist of metastatic lesions of malignant melanoma. Benign melanocytoma of the brain or spine has only been described in about 90 cases, with lesions more frequently arising infratentorially and intramedullary. Intramedullary tumours are rarely associated with syringomyelia or syringobulbia.

*Materials and Methods* : We present the case history of a 51-year old man who presented with sensory disturbances in the right hand for more than one year, gradually involving the entire right arm, neck, right hemithorax and later on the right foot. Clinical examination confirmed these sensory disturbances and showed right-sided pyramidal signs. MRI of the brain and the spine revealed a solitary intramedullary space-occupying lesion at the C1-C2 level associated with syringobulbia and syringomyelia. The lesion, which perioperatively presented as a dark-pigmented well-defined mass, was totally resected. After surgery there was a transient paresis of the right arm and leg that recovered well. Pathological

examination revealed the presence of melanocytic cells in the lesion without any sign of malignancy, so the rare diagnosis of melanocytoma was made. Extensive dermatological and oncological investigations did not reveal any other pigmented lesions.

*Discussion* : Melanocytoma of the central nervous system is a rare oncological entity, which has only been described about 90 times. These case reports almost always present a benign course with no recurrence, although in about 12 cases there was local recurrence of the lesion or droplet metastasis in the cerebrospinal fluid and in one case even extra-neural dissemination. At recurrence the lesion is often malignant and resembles malignant melanoma.

**A rare complication of shunt removal.** K. VAN ROMPAEY<sup>1</sup>, S. VANDAELE<sup>1</sup>, R. ATES<sup>1</sup>, R. LAUWEREYS<sup>2</sup>, K. ERNST<sup>3</sup>, J. DE SCHEPPER<sup>2</sup>, C. CHASKIS<sup>1</sup>, J. D'HAENS<sup>1</sup> (Departments of Neurosurgery<sup>1</sup>, Paediatrics<sup>2</sup> and Radiology<sup>3</sup>, A.Z.-V.U.B. Brussels).

*Introduction* : Shunt complications are numerous. To quote R. Mc. Laurin : “the history of the evolution of ventricular shunting for hydrocephalus is largely a history to prevent the complications of shunting”. An increased awareness of CSF-shunt complications will lead to improve patient outcome, therefore we present an unusual complication after shunt-removal.

*Case Report* : This 12-year old boy was born at 27 weeks and had a neonatal history of subependymal and intraventricular hemorrhage with hydrocephalus. At two months of age a shunt was inserted. When aged 5 and 6 years a shunt revision was needed due to infection. His neurological development and growth was normal. He remained well till the age of 12 years when he was admitted with an infection at the overlying wound of the shunt valve. A culture analysis revealed a Staphylococcus Aureus. Since there was no sign of meningitis, ciprofloxacin was given orally. However, two weeks later the drain was externalized. The decision was made to remove the shunt. A CT-scan performed 1 day before the operation showed a low position of the tip of the ventricular catheter in the infundibulum of the third ventricle. During the operation no traction was needed to withdraw the proximal tip. There was a clear occlusion of the proximal catheter, an infection was present (S. Aureus). Uneventful one hour after shunt removal he developed severe frontal headaches and diabetes insipidus. The urgent CT-scan showed a hyperdensity at the suprasellar cistern suggesting the presence of hemorrhage.

Sagittal T1-weighted spin-echo MR imaging demonstrated, after contrast injection a thickening of the infundibulum and enhancement of the pituitary stalk, suggesting the injury of the stalk. Dynamic MRI with maximum relative enhancement-map showed reduced enhancement in the lower pituitary, suggesting partial hypoperfusion. The patient developed panhypopituitarism, necessitating permanent complete hormonal substitution.

*Conclusion* : If the decision is made to remove a shunt, consideration needs to be given to the risks involved. Removal of a shunt with suprasellar positioning of the proximal tip can cause a section of the pituitary stalk. To our knowledge this is the first time panhypopituitarism is described after shunt removal.

**Granuloma associated with intrathecal drug therapy causing spinal cord compression.** F. WEYNS, D. PEUSKENS, L. NIJS, J. WUYTS, J. MONSTREY (Department of Neurosurgery, Ziekenhuis Oost-Limburg, Campus Sint Jan Genk).

*Introduction* : Chronic inflammatory mass lesions at the tip of an intrathecal drug infusion catheter are rare complications most frequently seen with the administration of opioids. We report a patient that presented with a progressive spastic paraparesis caused by an inflammatory mass lesion in the thoracic region.

*Materials and methods* : A 64-year old woman that had been treated with intrathecal opioids for failed back surgery syndrome presented to our service with a progressive spastic paraparesis. MR imaging showed an intradural lesion with spinal cord compression at level D9 and D10 centered around the tip of the intrathecal catheter.

*Results* : An urgent laminectomy was performed, showing arachnoiditis and an intradural extramedullary nodular lesion adherent to the spinal cord. The lesion was carefully removed along with the spinal catheter thus decompressing the spinal cord. Postoperatively our patient recovered rapidly. Bacteriological and pathological examination showed an aseptic inflammatory granuloma.

*Conclusions* : Spinal cord compression caused by an intradural granuloma around the tip of an intrathecal drug administration catheter is an infrequent but serious complication of intrathecal therapy. Since timely diagnosis is needed to avoid permanent neurologic deficit, a high index of suspicion should be kept for these patients.

**High resolution MRI-based anatomical analysis of neurovascular compression in 80 patients with essential trigeminal neuralgia.** J. LORENZONI, N. MASSAGER, F. DESMEDT, F. SCHOOVAERTS, O. COUSAERT, D. WIKLER, J. BROTCHE, M. LEVIVIER (Gamma Knife Center & Dept of Neurosurgery, Hôpital Erasme, Free University of Brussels, Brussels, Belgium).

*Objective* : To study the anatomical characteristics of neurovascular compression (NYC) using high resolution MRI in a series of patients with idiopathic trigeminal neuralgia (ITN).

*Material and Methods* : Analysis of the anatomy of trigeminal nerve (TN), brain stem (BS) and vessels was made in a series of 80 consecutive patients treated by Leksell Gamma Knife radiosurgery for ITN between January 2000 and January 2004 (The existence of a NVC is compatible with radiosurgery and has been proposed as a good prognostic factor for outcome). One mm thick 3D axial slides MRI (T1, T1 Gadolinium-enhanced and T2 SPIR) with coronal and sagittal reconstructions were viewed in a dynamic manner using the software GammaPlan 5.31. Three-dimensional reconstructions were made as well.

*Results* : In 73 patients (91%), there was some vessel in contact with TN or BS near the nerve insertion. The superior cerebellar artery alone or in association to others vessels was the identified vessel in 59 cases (81%). Other vessels identified were the antero-inferior cerebellar artery, the basilar artery, the vertebral artery, and veins. In 7 patients (10%), 2 different vessels were identified. In 33 patients (45%), the NVC was located proximally in a juxta-pontine position, (less than 3 mm to the brain stem), in 40, (55%) in a distal cisternal position. Nerve dislocation by the vessel was observed in 25 cases (34%) and nerve atrophy was identified in 20 (25%). Four patients (5%) underwent surgical neurovascular decompression after radiosurgical treatment failure or recurrence ; in 3 we had intraoperative imaging records. In two cases there was an excellent anatomical correlation with the MRI findings. In the third case the main vessel in contact was well identified, but some microanatomical details were missing.

*Conclusions* : High resolution MRI allows a quite accurate estimation of the anatomical characteristics of neurovascular compression in patients with ITN and could be useful for selecting and planning therapeutical.

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## STEREOTACTIC & FUNCTIONAL NEUROSURGERY

**Radiosurgical treatment of cerebral arteriovenous malformations. Experience with 89 patients.** R. ATEŞ<sup>1</sup>, K. VAN ROMPAEY<sup>1</sup>, D. VANDENBERGE<sup>2</sup>, F. VAN TUSSENBROECK<sup>3</sup>, C. CHASKIS<sup>1</sup>, J. D'HAENS<sup>1</sup> (Department of Neurosurgery A.Z.-V.U.B.<sup>1</sup>, Department of Radiotherapy A.Z.-V.U.B.<sup>2</sup>, Department of Radiology A.Z.-V.U.B.<sup>3</sup>).

*Introduction* : Radiosurgery is proven to be an effective primary or secondary treatment modality for cerebral AVM's. 20 Gray radiation dose to the margin of the nidus is during the years determined as effective and relatively safe. Exceptionally, with larger AVM's, a lower dose is indicated to avoid radiation induced lesions of the surrounding normal neuronal tissue.

*Aim* : To discuss our clinical experience with AVM's radiosurgically treated, using a linear accelerator (Fisher, Peacock/Nomos and since 2000, Brainlab/Novalis system with an adjustable micro-multileaf collimator). To investigate the influences of changes in methods and materials during the whole period of study.

*Methods* : In every case we used a stereotactic frame with CT images to delineate the radiation target. These images are fused with previously frameless made magnetic resonance images. Since 1999, we also base our dose planning on biplanar stereotactic angiography.

*Population* : 89 Cases with cerebral AVM's were treated radiosurgically between 1992 and 2004. Summarized clinical features leading to diagnose are : 46% bleeding, 23% epilepsy, 13% headache, 8% incidental, 4% other (hemifacialgia, hallucinations, ...). 16% was associated with arterial aneurysms. 78% underwent endovascular embolization prior to radiosurgery. Included patient had to have undergone follow-up imaging, ideally yearly MRI and an angiography 2 years after treatment. This reduces our included population to 54 cases.

*Results* : 45 (83%) Patients had a complete occlusion of the malformation after a mean follow-up period of 2,8 years. Morbidity rate was determined as 15% with mostly reversible radiation induced symptoms (seizure, alopecia, radionecrosis, delayed cyst formation). One single patient with an AVM occupying the complete fossa posterior died during the follow-up period due to bleeding while placing ventriculo-peritoneal shunt.

*Discussion* : The 83% obliteration rate compares favorably to results found in literature. Since the introduction of biplanar stereotactic angiographical and Novalis planning no treatment failure occurred. With the Novalis system (single isocenter, dynamic arc beam shaped radiosurgery), the treatment related complications have the tendency to reduce.

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**Comparison of fMRI-guidance to electrical cortical brain mapping for targeting selective motor cortex areas : a study based on intraoperative stereotactic navigation for motor cortex stimulation in neuropathic pain.** P. VOORDECKER, B. PIROTTE, T. METENS, D. WIKLER, DENOLIN, C. NEUGROSCHL, D. BALERIAUX, J. BROTCHE, M. LEVIVIER (Department of Neurosurgery and Neuroradiology, ERASME Hospital, University of Brussels).

*Introduction* : The analgesic efficacy of epidural motor cortex stimulation (MCS) in refractory central neuropathic pain (rP) is under evaluation. Intraoperative cortical brain mapping (iBM) is the standard functional procedure to localize the motor target. Although very precise, iBM is often impaired by severe wave attenuation. Because appropriate targeting is crucial to obtain pain relief, we applied stereotactic image-guidance to MCS by using a frameless navigation system allowing to correlate data from different targeting methods. We assessed the contribution of combining the functional magnetic resonance imaging (fMRI) to iBM to improve the quality of the targeting method.

*Methods* : Eighteen patients (10F/8M) suffering from rP (Ischemic/traumatic [12 cases] ; trigeminal [6 cases]) underwent MCS surgery under general anesthesia. iBM was used as functional targeting method. Preoperatively, motor cortex activation after motor tasks of both hands (+foot/face when painful) were studied by fMRI. Intraoperatively, the stereotactic coordinates of motor target defined by MRI and iBM were correlated spatially to the contours of fMRI-activated motor areas in all patients to assess the contribution of combining fMRI to iBM.

*Results* : Pain relief was obtained in 11/18 patients. Excellent matching between contours of fMRI-activated areas and iBM target of the hand on precentral cortex (focus of highest electrical wave within contours of fMRI-activated area) was found in 11 patients. fMRI helped to confirm the functional target of the hand (taking as target from iBM the one that projected within the contours of fMRI-activated area) in 6 others in which iBM was impaired by wave attenuation and not strictly reproducible. fMRI helped to confirm the target of foot/face in 3 patients in which iBM provided approximative target. Finally, in one patient, fMRI data were unconvincing (poor cooperation during imaging process).

*Conclusion* : Although specific issues of fMRI technique must be validated prior to its use in routine image-guidance, these preliminary data showed that : 1) fMRI-guidance can provide data matching those obtained by independent method of functional targeting, 2) combining both techniques could help in validating fMRI-guidance as a valid adjunct to iBM for improving the functional targeting method, 3) this combination could improve the analgesic efficacy of MCS.

**Management of vestibular schwannoma by linear accelerator radiosurgery vs. fractionated stereotactic radiotherapy : a single-institution review-based study.** M. MOENS<sup>1</sup>, K. VAN ROMPAEY<sup>1</sup>, R. ATEs<sup>1</sup>, L. CAVENS<sup>1</sup>, C. CHASKIS<sup>1</sup>, D. VAN DEN BERGE<sup>2</sup>, J. D'HAENS<sup>1</sup> (Departement of Neurosurgery<sup>1</sup>, Departement of Radiation Oncology<sup>2</sup> A.Z.-V.U.B.).

*Purpose* : In this single-institution trial, we reviewed our clinical results of radiosurgery (RS) versus fractionated stereotactic radiotherapy (FSRT) for vestibular schwannoma (VS) with respect to treatment-related toxicity and local tumor control. The aim of this study is to investigate if FSRT offers a higher potential sparing of cranial nerve functions.

*Methods and materials* : Between 1992 and 2002, 72 consecutive patients have received RS or FSRT for VS. Sixty seven patients had follow-up more than 1 year and were the subject of this report. We identified 52 patients treated with RS (12 grade I, 18 grade II, 13 grade III and 9 grade IV according to Koos) and 15 treated with FSRT (1 grade I, 5 grade II, 7 grade III and 2 grade IV). Before April 2000 patients were treated by a LINAC fitted with round collimators and after, until now by a dedicated micromultileaf Novalis<sup>®</sup> LINAC system. The mean dose to the periphery (isodose 80%) was 13,2 Gy (range 12 Gy to 14 Gy) for the single fraction group and the majority of the fractionated radiotherapy group were treated with 10 X 4 Gy. Tumor control was assessed with serial radiological imaging. Hearing preservation was assessed using Gardner-Robertson grades and with averaged pure tone audiogram thresholds. Facial nerve function was assessed using House-Brackmann grades. Details of complications including other cranial neuropathies, nonspecific vestibulo-cochlear symptoms and development of hydrocephalus were studied.

*Results* : Outcome differences between the single-fraction treatment group to the fractionated treatment group with respect to local tumor control (94% vs. 93%), trigeminal nerve preservation (75% vs. 80%) and facial nerve preservation (87% vs. 93%) were not statistically significant. The difference in serviceable hearing preservation (82.5% vs. 60%) was also not statistically significant.

*Conclusions* : Fractionated stereotactic radiation therapy seems to be as good as single-fraction radiosurgery according to tumor control and V<sup>th</sup> and VII<sup>th</sup> cranial nerve preservation. The higher percentage of hearing preservation with single fraction radiosurgery can be explained by the higher percentage of small tumors in this group. Further studies are needed to obtain more statistically significant results.

**Selective neurotomy of the tibial nerve for the management of the spastic equinovarus foot.** T. GUSTIN, C. GILLIARD, J. JAMART, T. DELTOMBE (The Spasticity Group, Departments of Neurosurgery, Physical Medicine and Rehabilitation and Biostatistics, Cliniques Universitaires UCL de Mont-Godinne).

*Introduction* : Equinovarus deformity of the foot, due to excessive spasticity, is one of the most frequent sequelae of central neurological lesions. Foot spasticity may cause severe functional disability, as it leads to abnormal posture, articular deformity, pain and unstable gait. When conservative therapies have failed, the spasticity can be abolished by a simple neurosurgical procedure, the selective neurotomy of the tibial nerve.

*Patients and methods* : We report a series of 34 hemiparetic adult patients who underwent a tibial neurotomy for a spastic foot deformity including equinus, ankle clonus, varus and/or tonic claw of the toes. All patients were able to walk, 16 (48%) of them with a splint. Before the surgical decision, a motor nerve block was performed systematically in order to assess the responsibility of each muscle for the foot deformity and to predict the result of surgery.

*Surgical technique* : Under general anesthesia, the tibial nerve was exposed through a popliteal approach. The motor nerve branches were dissected and identified by stimulation with a specific tripolar microelectrode. The selected nerve fascicles were then partially sectioned under microscope, over a length of 5 to 10 mm. Extent of resection (25 to 90%) was determined according to the preoperative clinical evaluation. At least a soleus neurotomy was performed in all cases. Depending on the clinical pattern, a gastrocnemius (22 patients), tibialis posterior (28 patients), flexor hallucis or flexor digitorum longus (21 patients) neurotomy was also performed.

*Results* : After surgery, spasticity and clonus disappeared in all cases. The median Ashworth's score decreased from 3 to 0 ( $p < 0.001$ ). Globally, all patients experienced a functional improvement with suppression of the equinus deformity. The mean ankle angle increased significantly from -6.2 to 3.5 degrees ( $p = 0.001$ ) during the stance phase of gait and the mean varus angle from -10.6 to 1.8 degrees ( $p < 0.001$ ). Tonic flexion of the toes was markedly reduced with a mean score decreasing from 1.4 to 0.4 ( $p < 0.001$ ). Walking velocity slightly increased from 1.72 to 1.99 km/h ( $p = 0.014$ ). The splint could be removed in 56% of patients. The only complication was a transient neuropathic pain of the first toe in one patient.

*Conclusion* : Tibial neurotomy is a simple and effective technique for the treatment of spastic foot. It should be proposed to selected patients only, after a careful evaluation of clinical status and kinematic parameters of the gait.

**Sacral anterior root stimulation with dorsal rhizotomy (Brindley technique) for bladder control in spinal cord injured patients.** D. MARTIN<sup>1</sup>, V. KEPENNE<sup>2</sup> (Department of Neurosurgery<sup>1</sup>, Department of Urology<sup>2</sup>, University of Liège, C.H.U. Sart Tilman (B35), B-4000 Liège).

*Introduction* : Patients with a stable supra-sacral spinal cord lesion (paraplegia, tetraplegia) presenting a reflex bladder are exposed to vesico-sphincter dysfunctions (incontinence, vesicosphincter dyssynergia resistant to medical treatment with the risk of upper urinary tract involvement) which can aggravate the vital or functional prognosis.

*Methods* : The objective of the Brindley technique is to improve bladder emptying, thereby to eliminate urinary infection and to preserve kidney function. It also assists in defecation and enables male patients to have a sustained full erection. The Brindley-Finotech bladder stimulator delivers intermittent stimulation to the anterior sacral roots. In order to improve the bladder capacity, a posterior sacral rhizotomy must be performed to interrupt the reflex response and to suppress detrusor and sphincter hyperreflexia.

*Results* : In our unit, we implanted 4 patients with a complete thoracic spinal cord lesion. All the patients have an improved quality of life after implantation with the Brindley stimulator. The bladder capacity was constantly improved and all the patients became continent. Micturation was excellent with low residual volume and low rate of urinary tract infections. We observed only one complication, a CSF fistula (subcutaneous pseudomeningocele without leakage) needing a reoperation to improve the closure of the dura around the electrode exit. We did not observe any infections or any material failure.

*Conclusions* : The Brindley technique is an excellent alternative to medical treatment in these highly distressed patients. It restores satisfactory continence and improves psychological as well as economical constraints related to auto/hetero catheterisations performed several times a day.

**Comparative study of the effect of electrical stimulation in the nucleus accumbens, the mediodorsal nucleus of the thalamus and the bed nucleus of the stria terminalis on compulsive behaviour in rats.** K. VAN KUYCK, K. BRAK, R. VANLAER, J. DAS, L. ARCKENS, B. NUTTIN

*Introduction* : When applying electrical stimulation in the anterior limbs of the internal capsules in patients with obsessive-compulsive disorder (OCD) a frequent exchange of the implanted batteries is necessary because of high energy consumption. Therefore, we are in search for a less energy consuming brain target where similar or better therapeutic results are achieved. In the 'schedule-induced polydipsia rat model' excessive drinking models compulsions in patients with OCD.

*Aim* : We compared the effect of electrical stimulation in the nucleus accumbens (nacc), the mediodorsal nucleus of the thalamus (md) and the bed nucleus of the stria terminalis (bst) on compulsive drinking in rats in the 'schedule-induced polydipsia model'.

*Materials and methods* : Food pellets administered each minute induced excessive drinking in rats. Animals were included if drinking 8 ml/30 min or more during the last of 25 preoperative test sessions. They were randomly divided into four groups : electrode implanted in the 1) nacc ( $n = 7$ ), 2) md ( $n = 8$ ) or 3) bst ( $n = 8$ ), or 4) a sham-operated con-



trol group (n = 7). Postoperatively, each rat of group 1, 2 and 3 was randomly tested in the model using either a frequency of 2 Hz and 100 Hz, each at an amplitude of 0.1, 0.2, 0.3, 0.4 and 0.5 mA, or without stimulation. The pulse width remained fixed at 0.05ms. Group 4 was tested 11 times without stimulation. Each day the rats were tested in random order. The electrode position was histologically verified.

*Results* : High frequency stimulation decreased water intake in the first 3 groups in a stimulation amplitude-dependent manner, with the highest efficacy in the bst. In contrast, low frequency stimulation had no effect on drinking in the 'schedule-induced polydipsia' model.

*Conclusion* : The bst might serve as a target for electrical stimulation in OCD in humans. However, animal models for OCD have their limitations.

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## VARIA

**Indirect hemihypoglossal-facial nerve anastomosis for treatment of unilateral facial palsy with greater auricular nerve graft.** J. MANNI, B. D'HAEN, H. COLLE, G. ALESSI, B. NOENS, L. DE WAELE (Department of ENT, Academic Hospital Maastricht, Departement of Neurosurgery AZ StLucas Ghent).

*Introduction* : Facial nerve palsy is a possible complication of posterior fossa surgery. Direct hypo glossal-facial nerve anastomosis has been a succesfull surgical solution until now. A major disadvantage however of this technique is an unilateral tongue atrophy and paralysis. We present two cases which were treated in our department. We analyse a previous prospective study of 39 cases of hemihypoglossal-facial nerve anastomosis without loss of function of the tongue. Surgical technique, using a greater auricular nerve graft, and results are discussed. Two cases are presented with facial nerve palsy, one after resection of a grade four acoustic neuroma and one after resection of a cavernous angioma of the brain stem. The operative technique is described. A prospective study of 39 patients will be presented.

*Methods* : Tongue function was assessed in 39 consecutive patients who underwent this procedure and facial recovery was assessed in 29 of these patients who had completed at least 24 months follow-up. Facial nerve function was judged using the House-Brackmann (HB) facial nerve grading system.

*Results* : Tongue movements were normal in all operated patients : one patient had mild homolateral atrophy. Initial facial movements occurred on average 7.5 months postoperative (range 4 to 18 months) in all but one patient. The results were graded HB II in 6 patients, HB III in 13, HB IV in 7, HB V in 2 and HB VI in 1 patient. Hemifacial synkineses were noticeable but no mass movements or gross hypertonia were observed (as are more often present in direct hypoglossal-facial anastomosis). The results of facial were significantly better in young patients. A short time interval between paralysis and surgery was also a good prognostic factor. HB grade II was achieved only in the duration of paralysis less than 12 months.

*Conclusion* : Indirect hypoglossal-facial anastomosis with interposition of a greater auricular nerve graft allows preservation of the tongue function together with good overall facial recovery, and is therefore to be preferred to the classical direct hypoglossal-facial anastomosis.

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**Decompressive craniectomy in children with severe traumatic brain injury : preliminary results of a prospective study.** A. LUBANSU, D. DETEMMERMAN, D. VERHEULPEN, J. BERRE, P. DAVID, J. BROTCHE, B. PIROTTE (Department of Neurosurgery, Hôpital Erasme, Université Libre de Bruxelles, Brussels).

*Introduction* : Decompressive craniectomy (DC) including duraplasty has been proposed for treating critically raised intracranial pressure (ICP) in children with severe traumatic brain injury (TBI). The procedure is considered when the ICP becomes refractory to intensive therapy and raises to uncontrollable values. The neurological outcome of operated children is under evaluation. In our center, we prospectively performed DC in children with severe TBI. Herein, we present our preliminary data.

*Methods* : Since January 2000, 6 children (4M/2F ; aged 3,3,5,8,12 and 14 years) were included in a protocol of DC after severe TBI. All patients received an intensive care treatment according to a standard protocol including continuous ICP monitoring, sedation, normothermia, hyperventilation and dopamine infusion to maintain adequate cerebral perfusion pressure. Clinical status, computerized tomography (CT) scans, and ICP levels were documented. DC (Unilateral in 5 ; bilateral in 1) was considered after a sustained increase of ICP > 30mmHg during more than 30 mm or a cerebral perfusion pressure inferior to 45mmHg under maximal intensive care treatment. In all cases, a wide fronto-temporo-parietal craniectomy followed by a duraplasty covered with temporal muscle fascia were performed. The outcome was assessed according to the Glasgow Outcome Scale (GOS), 6 and 12 months after TBI.

*Results* : The mean delay between TBI and DC was 68 hours. The ICP decreased < 25 mm Hg in all cases and cerebral perfusion pressure improved to recover normal values (> 75 mm Hg). One child died from brain oedema with uncontrollable ICP 20 days after bilateral craniectomy. The GOS scores were surprisingly good in the other 5 children as compared to the initial situation : 3 had a moderate neurological deficit [a spastic hemiparesis in 2 and a verbal impairment in 1], 1 kept a severe deficit and the last one recovered a complete social rehabilitation.

*Conclusion* : This preliminary series suggests that DC could : 1) be effective to control ICP in children with severe TBI, 2) reduce the mortality rate after TBI, 3) help to recover limited neurological morbidity in selected cases.

### **Endovascular aneurysm treatment : angiographic and clinical follow-up in a series of 114 consecutive lesions.**

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*Introduction and material* : Despite the publication of the ISAT and related studies, the persistence of the benefit of the endovascular treatment of intracranial aneurysms remains a controversial issue. The goal of this retrospective study was to evaluate the results of such treatment in the consecutive series of 104 patients treated at the CHU of Liege between November 1995 and august 2003. A total of 114 aneurysms were tentatively treated endovascularly. 49% of the lesions had bled prior to treatment (SAH group). 9 aneurysms were treated twice and 3 lesions were embolized after treatment failure at other centers. One lesion consisted of a remaining aneurysm neck following surgery.

*Results* : A total of 115 procedures were performed, with an immediate complete obliteration rate of 67.5% and a subtotal obliteration rate of 14.6%. 19 aneurysms could not be treated endovascularly at first attempt, although 2 of these lesions were successfully obliterated during a second look endovascular procedure. 4 lesions were subsequently treated surgically. Most aneurysms were treated with Guglielmi's detachable coils, although 9 endovascular obliteration of the carrier vessel were performed (7.9%). Permanent (stent) or transient (balloon) endovascular remodeling of the carrier vessel was obtained in 12 cases, and large aneurysm necks were occluded with Tn-span coils in 7 cases. Among the patients who had presented with a SAH, 16 patients died within weeks of the procedure. 11 of these patients had however presented with a WFNS score ? 4 and in only 2 was death obviously related to the procedure (i.e., 3.9% of this group). One electively-treated patient died from aneurysm rupture during the second staged treatment of multiple aneurysms (1.9%). Mild, non-debilitating, permanent neurological deficits developed in 9 patients (8.6%). Transient neurological deficits occurred in another 9 patients (8.6%). Among the living patients, 3 were lost to follow-up after the initial procedure. In the remaining 78 treated aneurysms, no re-bleeding was encountered at a median follow-up of 25 months (extremes : 5-110). A few aneurysms that were initially occluded showed a slight (neck, 10 lesions, 12.8%) or moderate (4 lesions, 5.1%) revascularization, usually within 12 months. Of these, one was subsequently treated surgically and two worsening repermeabilizations await a repeated endovascular procedure. Interestingly, 7 incompletely treated aneurysms eventually became occluded within a year (9%).

*Conclusions* : The endovascular treatment of aneurysms at our center proved to be rather safe and efficient in this retrospective analysis of a consecutive series of 114 lesions. The observed rate of partial aneurysm re-permeabilization, although significant, must be pondered by the similar rate of delayed occlusion and the absence of aneurysm rupture at follow-up.

### **Surgical treatment for refractory epilepsy.** H. ARDON, J. VAN LOON, W. VAN PAESSCHEN<sup>1</sup>, L. LAGAE<sup>2</sup>, J. GOFFIN (Department of Neurosurgery, Department of Neurology<sup>1</sup>, Department of Paediatrics<sup>2</sup>, University Hospital Leuven).

*Introduction* : Patients with refractory epilepsy, i.e. epilepsy that is not controlled by treatment with several anti-epileptic drugs, are possible candidates for surgical treatment. The aim of the presurgical evaluation is to identify the epileptogenic focus, and to assess if resection (lesionectomy) or disconnection of this focus can be performed safely. The results of a consecutive series of patients treated with epilepsy surgery are presented.

*Patients and methods* : A consecutive series of 107 patients who underwent epilepsy surgery between 1998 and 2002 was studied, excluding patients treated with Vagus Nerve Stimulation (n = 28). Inclusion criteria were : refractory epilepsy, surgical treatment, and follow up of at least one year. Preoperative evaluation consisted of EEG, Video-EEG, interictal and ictal SPECT, PET, neuropsychological testing and psychiatric evaluation. Postoperative outcome was classified according to Engel.

*Results* : The mean age at surgery was 34 years (range 6 months to 58 years). In only 77% of the patients all preoperative investigations showed the same epileptogenic focus (100% concordance). In 68% of the patients hippocampal sclerosis was the presumed cause of the epilepsy (temporal lobe epilepsy) and in these patients amygdalohippocampectomy (AHE) was performed. Other lesionectomies (mostly for cortical dysplasia) were performed in 28%. Four patients underwent hemispherotomy for unilateral multiple epileptogenic foci. The mean follow-up duration was 38 months (range 14 to 68 months). Postoperative outcome according to the Engel-classification was as follows : 69% class I, 13%

class II, 15% class III, 2% class IV. Most complications were transitory (dysphasia, memory deficits, visual field defects, early postoperative epilepsy). One patient died postoperatively.

*Conclusion* : Engel-class I and II are considered to be favourable outcomes ; in this study 83% of the patients had such an outcome which is comparable to other studies. Patients who underwent amygdalohippocampectomy for hippocampal sclerosis had even better results with 90% of them having a favourable outcome. We therefore conclude that surgery should play a major role in the management of refractory epilepsy.

**Selective vestibular nerve section as a treatment for intractable vertigo in Ménière's syndrome. Experience in four cases.** G. ALESSI, H. COLLE, B. D'HAEN, B. NOENS, L. F. DE WAELE (Department of Neurosurgery, A.Z. St. Lucas Ghent).

*Introduction* : Intractable Ménière's syndrome is found in a small proportion of patients with complaints of dizziness. Fluctuating hearing loss, tinnitus and violent vertigo attacks form the characteristic triad of the Ménière's syndrome. Since the first description of the disorder, a variety of conservative and surgical treatments have been used. Diuretics, salt restriction and vestibular sedatives are ordinarily the initial treatments of choice. The surgical treatment depends of the degree of hearing loss. When hearing on the affected side is absent, labyrinthectomy is indicated. When hearing preservation has to be considered and vertiginous attacks are severely disabling, a selective microsurgical vestibular nerve section may be considered. We present our experience with this surgical technique in four patients.

*Methods* : Surgery was considered for four patients with Meniere's syndrome for whom medical management failed. Three patients had a normal hearing, one had 50% hearing loss on the affected side. All four patients complained of tinnitus. In all cases a selective vestibular nerve section was achieved through a retrosigmoid approach. Throughout the procedure a continuous neuromonitoring was performed. After identification of the nerve a selective transection was carried out. No postoperative problems were noted in these patients.

*Results* : Postoperatively all four patients had a perfect control of their vertigo. Medical treatment was no longer needed. Hearing remained unchanged in all four patients. Tinnitus remained unchanged.

*Conclusion* : Selective microsurgical vestibular nerve section is an excellent option in terms of vertigo control, hearing preservation and postoperative quality of life. This surgery is a direct and safe technique with high success in properly selected patients.

**The intrameatal vascular loop : a new cause for pulsatile tinnitus.** D. DE RIDDER, G. DE MULDER, T. VAN HAVENBERG, A. VAN GOETHEM, V. NOWÉ, J. VERLOOY, P. VAN DE HEYNING, H. THIERENS, L. DE RIDDER

*Introduction* : Pulsatile tinnitus is characterized by hearing the heart beat in one or both ears. It is caused by a resonance effect in the petrous bone in a normally functioning auditory system. Even after extensive investigations in 15% of the patients with pulsatile tinnitus no cause can be found. Based on radiological and surgical data, the authors suggest that a vascular loop entering the internal auditory meatus can as well be the cause of arterial, pulse synchronous tinnitus.

*Methods* :

1. MRI data : intrameatal vascular loop as cause for pulsatile tinnitus 52 patients with tinnitus are scanned on a 1.5 tesla MRI and analysed with high resolution 0.6 mm heavily T2 weighted images (CISS) for the presence of a vascular loop entering into the internal acoustic meatus. 63 ears are analysed, of which 17 suffer from unilateral arterial pulse synchronous tinnitus and 46 from nonpulsatile tinnitus.

2. Surgical data : internal acoustic meatus insulation in four patients with unilateral pulsatile tinnitus suspected to be due to an intrameatal loop the internal meatus is insulated by use of teflon which is placed in between the vascular loop and the wall of the internal acoustic meatus.

*Results*

1. MRI data : In the unilateral pulsatile tinnitus group 15 out of 17 patients demonstrate a vascular loop in the internal auditory canal, whereas in the non-pulsatile group only 4 patients out of 46 demonstrate a loop entering the internal auditory canal. This has a high statistical significance ( $p < 0.00001$ , Fisher's exact test).

2. Surgical data : In all four patients the arterial pulsations have disappeared. However in one patient the pulsations returned after two months albeit in a much lesser degree. This happened in the first patient and might be due to insufficient amounts of teflon being interposed. Pre- and postop audiometry are unaltered in all patients.

*Conclusion* : Vascular loops in the internal auditory canal may generate arterial pulse synchronous tinnitus due to bone conduction resulting in a resonance effect in the petrous bone. The tinnitus can be treated by teflon interpositioning between the internal auditory canal and the intrameatal vascular loop.

**The Belgian Society of neurosurgery in the internet : resources and future projects.** M. LEVEQUE, C. GILLIARD, F. VAN CALENBERGH (Webmaster, President and Secretary of the Belgian Society of Neurosurgery).

*Aim* : To provide to the Belgian Society of Neurosurgery (BSN) a new informative tool, cost effective and easily accessible for both BSN members and general public. To facilitate exchange of information within the Belgian community of neurosurgeons.

*Method* : The website was created in December 2002. It is located on a free web-hosting platform. Its internet address is [www.bsn.be](http://www.bsn.be). Although the site is accessible to everybody, there are special columns dedicated to members. In order to increase the interactivity, a "forum" and a rubric of questions to experts are been considered for development.

*Results* : The website offers information in English about the BSN structure, its board and by-laws. The list of members with contact details is available but with restricted access. The site offers a section of job opportunities, and provides an events calendar and a newsletter. The website also provides the scientific program of the annual meeting of the BSN and allows to view on-line abstracts that have been submitted. More than 5000 people have already visited the website. The BSN website is retrieved in first position on search engines Google and Yahoo, with keywords : neurosurgery + belgium. The cost of the website has been kept to a minimum, and it remains free of any advertising support.

*Conclusion and Perspectives* : As now our web site is well known, our challenge is to update it on a regular basis. One possible new project could be to create a new interactive column named "Questions to experts" based on what already exists on American equivalent sites. The practice of neurosurgery is increasingly becoming ultra-specialized and as such requires from professionals to share and put in common our knowledge. The neurosurgeon could contact one or several "experts" to submit clinical cases or images. This column would be restricted to members only. Creating a mailing list of experts is a difficult issue, since subspecialisation is not accredited in Belgium. The BSN annual meeting would be a good opportunity for a collegial discussion on this subject.

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