Proceedings Belgian Society for Neurosurgery
Mont-Godinne, 23th March 2002

Discectomy without fusion for cervical disc herniation. Preliminary results about 15 cases. J. GONZALEZ[1], J.-M. VUIDAR[2], G. MILBOUW ([1]Neurosurgery and [2]Radiology, C.H.R. Namur).

Introduction : Nobody questions the interest of a surgical decompression for refractory cervical disc disease but the clinical benefits of combining anterior cervical discectomy with bone graft placement versus performing anterior cervical discectomy alone remains controversial. The possibility of developing late kyphosis from disc-space collapse or radiculophathy from foraminal narrowing supported the anterior cervical discectomy with fusion (ACDF). After a round table of the SNCLF concluding that simple discectomy could give excellent results, we have performed such a technique for patient presenting with a soft disc prolapse.

Methods : Fifteen operation were performed on 15 patients with cervicale disc disease during the period January 2000 to October 2001. All the patients enrolled in this study were admitted for cervical disc hernia. 53,3% of them had a previous history of trauma. All patients have been treated conservatively without success. Each of them underwent ACD at single-level. Operative microscope was routinely employed. A simple discectomy was performed with abrasion of the adjacent vertebral end-plate. The posterior longitudinal ligament was systematically opened, and the foramina was explored. In the postoperative period, a soft neck brace was used for 15 days.

Results : The most common level involved was C6-C7 (66,6%) and the next most commonly involved level was C5-C6 (33,3%). The means postoperative hospital stay was 5,3 days. No patients experienced intra or postoperative complications. The mean length of the follow-up period is actually 1,3 years with a minimum of 3,6 months and a maximum of 22,8 months. The average age at the time of surgery was 40,9 years with a large male predominance (11 males and 4 females). The most frequent symptom was the brachialgia (86%). Cervicalgia was presented in 66,6% and deficit motor in 53,3%. One patient had gait disturbance and pain in the legs caused by spinal cord compression. All patients except 2 returned to their prior activities. Residual brachialgia was presented in 20%, but was largely reduced, and residual cervical pain in 26,6%. All patients with weakness retrieved their force and only 2 still need medical treatment at last follow-up.

Conclusions : Anterior cervical discectomy without interbody fusion using the operative microscope is a relatively simple technique, necessitating a short hospitalisation, giving a good relief of clinical symptoms without postoperative instability and allowing patients to regain quickly their prior activity. According to the conclusion of the round table of SNCLF, our observation show that this simple technique give at least the same result as anterior cervical discectomy with fusion.

Screw titane graft in the Cloward procedure : clinical and radiological results. S. HANCQ, O. DE WITTE, J. BROTCHI (Department of Neurosurgery, Erasme Hospital, Brussels).

Introduction : In the Cloward procedure, several alternatives to bone graft are proposed. In the department, we used a scew titane implant as interbody graft. We presented our clinical and radiological results.

Patients and methods : Since September 1998, sixty-one patients have been operated on with a screw titane graft. To have the longest follow-up as possible, we reviewed the 37 patients operated on between September 1998 and December 1999. There was 23 female and 14 male with a median age of 46,4. Most of them (30/37) presented radicular pain, five had myelopathy and the two others a mixed clinical status. Cloward procedure concerned one level for all patients. The most common level operated on was C5-C6 (19 patients), C6-C7 (9 patients), followed by C4-C5 (5 patients), C7-Th1 (3 patients) and C3-C4 (1 patient). Twenty-seven patients presented soft disc herniation, the others had anterior osteophytes. Surgical indication consisted in resistance of symptomatology after conservative treatment.

The surgical procedure was the Cloward technique with the use of an heterologous graft of Titane. The advantages of these graft were :

1) This graft was screwed : It can be insert meticulously (screwing and not impacted) and arthrodesis (cervical plate) was not useful.

2) The graft was hollow with two large openings on the two extremities (upper and lower). It was filled by the own patient's bone powder which allowed fusion with the bordering levels as with an autologous graft. Cervical collar was prescribed for one month. Follow-up consisted in standard X-Rays at 3 days, 2 months, 1 year and/or 2 years.

Results : There was no operative complication. Among the 30 patients with preoperative radicular pain, twenty-four had excellent results and 6 good results. Three of the five patients with myelopathy showed improvement, the two others were stable. *Radiological* results. No luxation of the graft were described. All X-Rays on the immediate postoperative time (35/37) showed a good position of the graft. Fusion occurred inside the graft (with the adjacent level) and around the stride of the screw. Fusion was visible on 14/16 X-Rays two years after operation.

Conclusion : Clinical and radiological results are good with this kind of graft. This graft is easy and safe to insert. It doesn't require any additionnal plate and screw and has the properties of an autologous graft. Thus, it seems to be suitable and sure.

Anterior cervical spine fusion using P.E.E.K material cages avoiding iliac crest spongiosa : experiences and results. A. STATHOPOULOS, V. PETROV (Neurosurgical Department, C.H.R Namur, Belgium).

Introduction : In cervical discectomy using the ventral approach, there are currently three main possibilities : replacement of the cervical vertebral disc with a synthetic material graft, replacement with iliac crest spongiosa, or no disc replacement. All three techniques are still under discussion. We propose an approach using poly-ethyl-ethyl-ketane-cages (P.E.E.K, Solis Stryker Spine), usually filled with hydroxylapatite material.

Material and methods : 20 patients (10 male, 10 female age 32-78, mean 55 years) were operated on a degenerative cervical disc herniation by ventral discectomy and replacement of the disc by the cage for fusion. The mean follow-up was 9.6 months. The pre-operative symptoms, were radiculopathies (n = 20). The diagnosis was confirmed by CT, MRI, and functional plain x-ray examination excluding instability. Level of the disc herniation : C3/4 n = 1, C4/5 n = 2, C5/6 n = 5, C6/7 n = 11, and 1 case with 2 levels. All patients were postoperatively controlled by x-ray examination.

Results : 17 patients were free of complaints, with a major improvement in 3 cases. Minor neck pain, residual radiculopathy was reported. The mean post-operative hospitalisation was 4.8 days. Post-operatively in all cases the x-ray control proved the correct placement of the cages.

Conclusion : For the anterior cervical fusion, the poly-ethyl-ethyl-ketane-cages (P.E.E.K) present good clinical results, with case of application, maintenance of disc space, decreased operating time, x-ray transparency and shorter post-operative hospitalisation. For long-term results, a longer follow-up and a increased number of patients is required.

Long term surgical results of 97 patients with a degenerative lumbar spinal canal stenosis treated by laminotomy without arthrodesis. A. TYBERGHIEN, M. RODRIGUEZ, F. BELBACHIR, G. DOOMS*, P. T. DANG (Department of Neurosurgery and Department of Neuroradiology*, Centre Hospitalier de Luxembourg (G.D. du Luxembourg).

Objectives : Despite of a perfect anatomoclinical knowledge, a considerable controversy about the appropriate surgical treatment for degenerative lumbar spinal canal stenosis (LSS) still exists. The goal of this study was to evaluate the effectiveness of surgery and long term radiological evolution of LSS treated by laminotomy, medial facetectomy without fusion.

Material and methods : We have studied retrospectively 97 consecutive cases of degenerative LSS treated by one senior neurosurgeon between 1990 and 1997 (53 with radiological and clinical assessment at the last follow-up visit, 44 only interrogated by phone or by questionnaire). There were 58 men and 39 women witb a mean age of 58 years (range, 34 to 84 years), 80% of the patients had a low-back pain and 92% a radicular pain, only 54% of them presented intermittent claudication. A neurological deficit (motor, sensitive or involving sphincters) was present in 12% of cases. The presence of an bulging disc which necessitated a discectomy was noted in 46 cases (48%). A spondylolisthesis with an intact neural arc, was found in 11 cases (21%). The analysis of the results is based on :

– The clinical evaluation according to the "Beaujon rating scale". The results are classified in function of the relative profit : excellent good, fair, and poor.
– The radiographic evaluation by static and dynamic standard X-rays at the last follow-up visit, to determine the presence of a secondary destabilization.

Results : The mean follow-up time was 7 years and 5 months (range, 4 years and 12 years). The global result was excellent in 50%, good in 38%, fair in 8% and poor in 4% of cases. Among the patients without preoperafive spondylolisthesis (42 patients), a secondary slipping appeared in 7 cases (16%). In the group of 11 patients with pre-existing grade I spondylolisthesis, slip progression was noted in 3 cases (27%). None of these cases was associated with a bad clinical result or needed reoperation. 6 patients were reoperated within a mean follow-up time of 14 months after the first

operation (range, 1 to 48 months). The indications for reoperation : re-stenosis necessitating new decompression (1 case), disc herniation (5 cases). None of these patients was reoperated for secondary destabilization.

Conclusion :

1) The decompression by simple laminotomy is an effective technique, with a high success rate at median and long term postoperative evaluations.
2) The risk of a secondary destabilization is minimal, even in patients with a preoperative spondylolysthesis.
3) Systematic arthrodesis is not justified, except for cases with grade II spondylolisthesis or more.

Thoracoscopic microdiscectomy. E. M. J. Cornips, E. A. M. Beuls, G. Geskes (azM (academisch ziekenhuis Maastricht), Nederland)).

Introduction : Until recently, literature on herniated thoracic discs was scarce and controversial, reflecting limited experience with this disease (presentation, evolution, diagnostics, indications, strategies and outcome of surgery). Modern diagnostics (MRI) show a much higher incidence than previously thought. We now realise sometimes small hernia's cause severe symptoms (eg progressive myelopathy) whereas larger ones don't, and unlike the cervical spine, the posterior part of the canal remains filled with cerebrospinal fluid even in the most severe cases showing evident myclomalacia. Whereas different posterior posterolateral approaches (laminectomy, costotransversectomy, transpedicular approach) all had significant limitations dangers, thoracotomy being the only anterior approach for most spinal (neuro)surgeons was too invasive and too unfamiliar. As minimally invasive (spine) surgery has been rapidly evolving the past 15 years, C. Dickman (United States) and D. Rosenthal (Germany) are to be credited for the application of principle to the treatment of thoracic hernia's. Recent evolution in endoscopy and custom-madc instruments made this possible. In 1994 the first thoracoscopic microdiscectomy was reported. Since then in the hands of the experienced surgeon it has proven to be truly minimally invasive, safer and more efficient any other treatment modality, without being more time-consuming.

Methods : we use the technique as described by Dickman and Rosenthal, except that the pedicle is not removed. After meticulous cadavertraining, having become completely familiar with the complex 3D anatomy (actually seen in 2D during the operation), every patient gets a thorough clinical and neuroradiological workup before operation is considered, including repeated neurological examinations testing every modality, chest X-ray, MRI, finally CT or on occasion myelo-CT to get a maximum of anatomical information. Our postoperative protocol consists of 3D CT reconstruction before discharge and meticulous clinical follow-up including MR at 3 months.

Results : six consecutive patients were successfully operated in our institution the past 15 months (aged 23-53 y). Two had progressive myelopathy (showing considerable improvement postop), three had a predominant pain syndrome in the leggs or part of the trunk, and a consistent sensory loss (one has complete pain relief, the other two partial, we expect them to further improve in time), one had isolated intercostal neuralgia due to a calcified latero-foraminal hernia and is completely cured. We never converted to open (mini)thoracotomy. All patients mobilised on day 1 (after removal of the chest-drain), made an uneventfull recovery and were discharged within a week.

Conclusions : in recent years thoracoscopic microdisecctomy has become an efficient and truly minimally invasive technique having enormous potential not only to improve comfort and cosmetics, but also to shorten hospitalisation and rehabilitation time. It is undoubtedly safer than reported posterior and posterolateral approaches, but this only holds true with meticulous preoperative training, thorough preparation of every individual operation and enough operations on a yearly base to retain and further refine ones surgical skills. Since we are far from completely understanding the complex pathofysiology of thoracic disc disease and since the thoracoscopic microdiscectomy technique is very new, interesting research remains to be done both experimentally and clinically.

Use of polylactide scaffolds in different models of spinal cord injury to promote axonal regeneration. F. Schils[1,2], R. Franzen[1], V. Maquet[3], J. Schoenen[1], D. Martin[1,2], A. Stevenaert[2] ([1]Center for Cellular and Molecular Neurobiology, University of Liège, Belgium ; [2]Dpt. of Neurosurgery, University of Liège, Belgium ; [3]Center for Education and Research on Macromolecules, University of Liège, Belgium).

Introduction : Reparation of spinal cord lesion needs to encounter multiple problems, i.e. the local management of the lesion, the successful regrowth of severed axons, the adequate targeting and finally the myelinisation in order to restore a function. Our repair model is dedicated to the first approach. Our goal is to create an adequate environment for regeneration by providing a 3-D architecture favorable to axonal regeneration. Different kinds of materials have been investigated for bridging spinal cord lesions with various successes. We reported axonal regeneration in the transected rat spinal cord using macroporous and highly oriented polymer scaffolds. In this study, we are developing a less invasive model of rat and mouse spinal cord lesion to focus on the corticospinal tract regeneration through a transplanted polymer.

Methods : Bioresorbable porous scaffolds were prepared by freeze-drying of poly(D,L-lactide) in organic solution. The scaffolds exhibited macropores with a diameter of 100-200 µm aligned according to a preferential direction, and highly interconnected micropores (10-30 µm) contributing the major part of pore volume and specific surface area.

The cylinders of polymer scaffold have been longitudinally implanted in the corticospinal tract after realization of a lateral hemisection. By this technique, the corticospinal tract was interrupted as well as the long ascending and descending pathways. The major advantage of this model is to be minimally invasive thus improving the animal survival and preserving the structural architecture of the spinal tissue.

Results : Our previous results showed that macroporous PLA scaffolds are perfectly integrated into the transected rat spinal cord. The polymer was invaded by different cell types including macrophages, Schwann cell, endothelial cells and regenerating axons. The model of lateral hemisection has been successfully applied to mice. We demonstrate that the polymer is well integrated into the host spinal cord and invaded by different kinds of cells, whose identification by immunohistology is in progress.

The better survival rates of the animals will allow us to perform behavioral tests to evaluate the effect of polymer implants on functional recovery. In vitro cultures of stem cells onto the polymer were realized to demonstrate their good survival on this biomaterial, leading to the use of a cell-seeded polymer as an optimal transplant.

Conclusion : These PLA scaffolds are promising materials because they offer a temporary highly oriented structure that allows cell migration, vascularization guiding and axonal regrowth. Moreover, they can be supplemented with neurotrophic factors and used as a support for cell transplantation. In this study, we are taking advantage of both strategies (biomaterials and cell transplantation) to promote axonal regeneration in a minimally invasive lesion.

Spinal extramedullary ependymal cysts : report of three cases. I. SEIDEMANN, B. DE COENE, C. GODFRAIND, C. GILLIARD, T. GUSTIN (Departments of neurosurgery and radiology, Cliniques Universitaires UCL de Mont-Godinne ; Department of neuropathology, Cliniques Universitaires UCL Saint-Luc, Brusssels).

Introduction : spinal intramedullary ependymal cysts are very rare. Only ten cases have been described in the literature.

Method : we report here three patients with ependymal cysts located in the conus medullaris and in the cervical spinal cord. We discuss the surgical management of these lesions.

Cases report : two patients with a cyst in the conus medullaris experienced radicular pain of the lower limb associated with hypesthesia and weakness of the foot. The third patient with a cervical cyst (C6-C7) complained of paresthesias of the upper extremities and described a Lhermitte's sign. She had also a multiple sclerosis. In all patients, MRI demonstrated a rounded, well-demarcated, cystic intramedullary lesion. The cyst was isointense to CSF on T1 and T2-weighted images. There was no enhancement of the cyst wall after administration of Gadolinium. Simple marsupialization of the cyst with biopsy was performed through a laminectomy in the three cases. Histological examination showed that the cyst wall was composed of a single layer of flattened cuboidal cells supported by a glial stroma. Periodic acid-Schiff (PAS) staining of the tissue was negative. The absence of basement membrane was confirmed by electron microscopy in one case. Neurological status of all patients improved rapidly after surgery. Postoperative MRI revealed only a small residual intramedullary cavity.

Conclusions : these findings suggest that MRI features of intramedullary ependymal cysts are characteristic and allow accurate preoperative diagnosis. In particular, absence of Gadolinium enhancement differentiates these lesions from cystic tumors. Surgical management of ependymal cysts is mandatory because of the risk of severe neurological impairement reported in the literature. We recommend marsupialization of the cyst into the subarachnoid space by posterior myelotomy, since complete enucleation is often prevented by adherence of the walls to the spinal cord parenchyma. Because of the lesion may recur, long-term MRI follow-up is required.

Cure of syringomyelia by liberation of an iodiopathic arachnoid malformation. M. BRUNEAU, C. RAFTOPOULOS, T. DUPREZ, D. ROMMEL (Cliniques Universitaires Saint-Luc, Bruxelles).

Introduction : Syringomyelia may be induced by numerous factors. We reported an exceptional case of syringomyelia due to an idiopathic arachnoid malformation.

Case report : A 34-year-old women, without any medical history, suffered from progressive gait disturbance since 18 months. Clinical examination revealed a motor palsy of the right lower limb, a hypoesthesia suspended from D5 to D10 and an hypoesthesia of the left lower limb. MRI showed a syringomyelia, divided into 2 compartments, extending from C3 to D6 and from D6 to D11. Between both segments, focal narrowing of the spinal cord was observed, without syringomyelia. At this level, the spinal cord appeared atrophic and applied against the anterior dura mater. Differential diagnosis were tethered spinal cord, transdural medullary herniation and posterior arachnoid cyst. During surgery, the thoracic spinal cord was focally compressed at the D6 level by a constrictive arachnoid malformation. It consisted of an

arachnoid membrane, extending from the postero-lateral dura to the pia of dorsal spinal cord. CSF flow was therefore compromissed. Surgery consisted in the release of the malformation and opening of the inferior syringomyelia cavity. After 3 months follow-up, clinical examination remained stable and the MRI study showed a collapse of the whole syringomyelia.

Discussion : Such an arachnoid malformation, without history of spinal trauma or inflammation, is the 3rd case reported in the literature. It is described as a variant of arachnoid cysts. Probably the compression of the spinal cord and blockade of CSF pulsation was responsible for the syringomyelia occurence.

Conclusion : We report an exceptional case of syringomyelia due to an arachnoid malformation. Its removal lead to the intramedullary cavity collapse.

Resection of peripheral nerve tumors : review of a 5-year experience. N. VANTOMME, F. WEYNS, J. WUYTS, J. MONSTREY (Department of Neurosurgery, Ziekenhuis Oost-Limburg, Campus St.-Jan, Genk).

Introduction : Peripheral nerve surgery is a significant part of the work in our department of neurosurgery. We evaluated the treatment of peripheral nerve tumors in our centre.

Methods : The clinical findings, imaging and histology of 24 patients with 26 peripheral nerve tumors were reviewed retrospectively.

These patients were operated on between 1996 and 2000. In all but four patients, clinical follow-up of at least 6 months was available.

Results : Preoperative motor weakness was observed in two patients. Pain at rest was present in 7 patients. In 7 patients paraesthesias or sensible loss were the presenting symptom.

In 8 patients a tumoral mass without neurological deficit was diagnosed.

Preoperative imaging (ultrasound, CT scan and/or MRI) was available in 14 patients.

Imaging did not provide any or little additional information for histologic diagnosis of these peripheral nerve tumors.

In 9 patients histologic examination revealed a neurofibroma (3) or schwannoma (6).

Others included angioleimyoma, lymphangioma, glomustumour, lipoma, ...

In 4 cases there was no intrinsic nerve tumor, but an extrinsic compression on the nerve.

Postoperatively, 11 patients were free of any symptoms. Eight patients revealed only minimal residual sensible deficit. In none of the patients, we observed an increase of neurological deficit. In two patients a second operation was necessary because of regrowing tumoral mass.

Conclusions : Resection of peripheral nerve tumors proved to be a safe and worthwhile procedure, as the majority of patients recuperated sigificantly postoperatively. Preoperative imaging was helpful for localising the tumor, but not for predicting histology.

Management of a chordoma of the upper cervical spine. G. DE MULDER, K. ENGELBORGHS, T. VAN HAVENBERGH, D. DE RIDDER, J. VERLOOY (Department of Neurosurgery, University Hospital Antwerp, Belgium).

Objective : Chordoma is a relatively rare tumor arising from a notochord remnant. These tumors develop at the skull base, sacrococcygeal region and cervical spine. We present a case report of a young patient with chordoma of the upper cervical spine. We discuss the surgical management and additional treatment modalities.

Methods : A twelve-year-old boy presented with right-sided herniparesis. CT and MRI of the cervical spine revealed an intraspinall extradural mass at the C2, C3 and C4 level with severe displacement and compression of the spinal card. The tumor extended through the right neuroforamina C2-C3, C3-C4 and C4-C5 to the prevertebral space. A two-step neurosurgical procedure was performed : 1) midline posterior approach with laminotomy C2, C3 and C4 permitted resection of the intraspinal extradural mass and partial debulking of the neuroforamina. 2) a high cervical lateral approach was used to resect the residual tumor in the prevertebral area and neuroforamina.

Results : The postoperative course was uneventful with complete neurological recovery. Postoperative imaging confirmed complete resection of the lesion. Pathological examination defined the tumor as chordoma. Although complete resection was resumed we opted for additional proton beam therapy.

Conclusion : We present a case of chordoma of the upper cervical spine. Primary complete resection is the treatment of choice. This was achieved by a two-step neurosurgical procedure. Additional proton beam therapy is advocated despite the presumed radical resection.

Intermittent abducens palsy in petrous apex lesion : cause and surgical treatment. B. KEGELAERS*, D. DE RIDDER, T. VAN HAVENBERGH, E. KOEKELKOREN, G. DE MULDER, K. ENGELBORGHS, P. VAN DEN HEYNING, J. VERLOOY (*H. Hart Hospital, Lier and University Hospital Antwerp, Belgium).

Introduction : Abducens palsy is a frequent symptom in intracranial pathology. It can be a sign of intracranial hyper- and hypotension, it is seen in vascular lesions of both the carotid and the vertebral artery, in tumors and trauma of the clivus and cavernous sinus, in infections of the petrous bone, etc. Intermittent abducens palsy's on the contrary are rare and are almost only encountered in petroclival tumors, usually with associated symptoms that lead to medical attention hearing loss, dizziness, tinnitus, facial dysethsesias.

Case Report : We present a 30 year old male patient with unilateral intermittent abducens palsy as the sole symptom. CT and MRI demonstrate a petrous apex lesion bulging in to the posterior fossa, most likely a cholesterol granuloma. Via an extradural middle fossa approach the petrous apex is opened and the cystic lesion removed, resulting in relief of the symptomatology.

Anatomo-pathology confirms the preoperative hypothesis of a cholesterol granuloma, which can be considered the result of chronic inflammation leading to an obstruction of the air source of normally pneurnatized bone. It can be both cystic or solid and is one of the most frequent petrous apex lesions.

Treatment consists of resection and opening the air source to the petrous apex, which is most easily and safely done via an extradural middle fossa approach (video), drilling the petrous apex in between the carotid artery plus GSPN, the geniculate ganglion plus cochlea, V3 and internal auditory canal, a surgical approach with minimal risk for hearing and facial nerve deficit.

Conclusion : Isolated intermittent unilateral abducens palsy caused by a petroclival lesion can be safely treated by an extradural middle fossa petrous apex approach.

Isolated diffuse intracranial meningiomatosis : a case report. R. ATES, K. VAN ROMPAEY, G. KOERTS, C. CHASKIS, J. D'HAENS (a.z.-v.u.b.).

Background : A meningeoma is a neoplasm of the central nerve system, which arises from the arachnoid cells. Meningiomatosis is a term used in those cases in which 2 or more meningiomas are present. It is a condition that also exist in some patient with type 2 neurofibromatosis (NF2), an autosomal dominant disease predisposing affected individuals to form meningiomas and schwannomas.

Patient : 53 years old female with moderate headache for 6 months. No further complains.

No familial history of a cancerous disease or systemic disorder.

No neurological deficits or other clinical features.

Diagnosis : The diagnostic criteria from Gutmann *et al.* is used to exclude NF2.

Investigations : blood, CT, MRI, conventional intra-arterial angiography of brainvessels, lumbar CSF punction, open biopsy, histology.

Result : diffuse intracranial meningiomatosis with 2 little nodular, frontal and Rolandic meningiomas at the left side. No signs of malignancy are found.

Treatment : None.

(Paracetamol symptomatically).

Evolution : Headache disappeared spontaneously 2 months after leaving the hospital. No control imaging yet executed.

Discussion : **"**Diffuse meningiomatosis" is an exceptional condition in which the whole meningal layer is thickened, with histological characteristics of a benign (grade I WHO) meningioma, not yet described in any genetic or systemic disorder. So far, we could not find any reported or documented case in the literature.

Benign Metastasizing Leiomyoma of the Nervous System. G. ALESSI[1], M. LEMMERLING[2], B. D'HAEN, H. COLLE[1], L. F. DE WAELF ([1]Department of Neurosurgery, AZ St Lucas, Gent ; [2]Department of Radiology (Magnetic Resonance), AZ St Lucas, Gent).

Objective and importance : We report two patients with benign uterine leiomyoma metastasizing to the nervous system, respectivily to the brain and to the spine. Although primary cranial and metastatic spinal leiomyomas have been rarely described, to our knowledge no case of benign leiomyoma metastasizing to the skull base has been reported before.

Clinical presentation : Two female patients with history of hysterectomy for benign leiomyoma, subsequently metastasizing to the lungs and smooth muscles of the skin, presented with a focal neurologic deficit. Magnetic resonance imaging revealed a sacral mass in one case and a skull base tumor in the other.

Intervention : Both patients underwent surgery for resection of the lesions.Good postoperative results were obtained. Histologic examination of the surgical specimen revealed a benign metastasizing leiomyoma.

Conclusion : Benign metastasizing leiomyoma should be considered in the differential diagnosis of mass lesions in the sacral spine, brain and skull base in patients who have a history of uterine leiomyoma or benign metastases of the same disease in organs outside the nervous system.

Key words : Benign metastasizing leiomyoma, sacral spine, posterior fossa tumor, gonadotropin releasing hormone, uterine fibroid tumor.

A 2-year experience with gamma knife radiosurgery in the management of brain metastases. J. Lorenzoni, D. Devriendt[1], V. Devos[1], P. David[2], F. Desmedt, N. Massager, P. Van Houtte[1], J. Brotchi, M. Levivier (Gamma Knife Center & Dept of Neurosurgery, [2]Dept of Radiology, Université Libre de Bruxelles, Hôpital Erasme, and [1]Dept of Radiation Therapy, Institut Bordet, Brussels, Belgium).

Introduction / Objective : Radiosurgery has emerged as an important modality in the management of brain metastases (BM), together with open neurosurgery and fractionated whole-brain radiation therapy (WBRT). Here we report our experience with Leksell Gamma Knife® (LGK) radiosurgery in patients with BM.

Material & methods : Between December 1999 and January 2002, we have treated 333 patients with the first worldwide installed LGK C. This included 73 treatment sessions for BM (22% of all treated patients) in 67 patients. Altogether, 134 BM were treated. In 40 cases (55%), multiple BM were treated in one session. The target volume for individual BM ranged from 12 to 17 800 mm^3 (mean : 2 464 mm^3). The mean prescription dose was 20 Gy (ranging from 16 to 25 Gy, depending on the size and the location, as well as previous history of WBRT) at the 50% isodose (range : 40 to 75%).

Results : The primary location of the tumor was the lung in 53 BM (40%), the breast in 33 BM (25%), a melanoma in 29 BM (22%) or another location in 19 BM (13%). Patients with multiple BM treated in one session (40 cases) had 2 (62.5%), 3 (22.5%), 4 (7.5%), 5 (5%) or 7 (2.5%) BM. Two patients had 2 separate sessions for lesions that could not be treated with a single frame placement. Based on clinical and radiological follow-up, tumor local control was obtained in 80% of the surviving patients that were reviewed. There was no additional neurological deficit. Two patients were operated for removal of BM and one patient was retreated locally with LGK, for further tumor growth and neurological worsening after radiosurgery. Long-term follow-up (> 18 months) was reviewed in the first 20 patients treated. Among them, 9 patients died from either system disease progression (6 patients) or neurological progression (i.e. new BM or meningeal carcinomatosis ; 3 cases). Two patients had 2 LGK and one had 3 LGK for the treatment of new BM, and are still alive.

Conclusions : LGK radiosurgery can be recommended as an alternative to neurosurgery in patients with BM without signs of intracranial hypertension or evolutive neurological deficit. It offers a high rate of tumor local control, even in so-called radioresistant BM. It allows to treat multiple lesions, even at the time of disease progression with new BM. The survival remains however related with the systemic control of the disease. The respective and complementary role of radiosurgery and WBRT in the multimodality treatment of BM remain to be determined.

(Supported by F.N.R.S., Loterie Nationale, and Ministère de la Politique Scientifique).

Characterization of the levels of expression of retinoic acid receptors (RARα, RARβ, RARγ), galectin-3, macrophage migration inhibitor factor (MIF) and P53 in a series of 51 adamantinomatous craniopharyngiomas. A. Lubansu[1], F. Lefranc[1], I. Salmon[2], J. Brotchi[1], R. Kiss[3] (Departments of [1]Neurosurgery and [2]Pathology, Erasmus University Hospital ; [3]Laboratory of Histopathology, Faculty of Medicine ; Free University of Brussels ; Brussels, Belgium).

Introduction : Craniopharyngiomas are defined histopathologically as benign tumors which can behave very aggressively at clinical level. They can originate from different types of embryonal epithelial tissue in which correct spatio-temporal regulation is disrupted on the level of production of effectors.

Material and methods : We therefore used of computer-assisted microscopy to quantitatively determine the immunohistochemical levels of expression of selected markers including retinoid acid receptors (RAR) as response elements to retinoic acid in a series of 51 adamantinomatous craniopharyngiomas. Such tumors may also originate following physiological defects in the apoptotic-mediated elimination of embryological remnants of epithelial tissue. Galectin-3, p53, and the macrophage migration inhibitory factor (MIF) are known to play crucial roles in these processes. We also quantitatively determined their levels of expression in the series of 51 craniopharyngiomas.

Results : Our data show that all craniopharyngiomas are immunoreactive for RARα, while their immunoreactivity for RARβ and RARγ dramatically varied from one case to another. Craniopharyngiomas with low levels of RARβ and high levels of RARγ are more likely to recur than those with higher levels of RARβ and lower levels of RARγ. Rapidly

recurring craniopharyngiomas also showed significantly lower levels of expression of galectin-3 and MIF than non-recurring or slowly recurring cases. Few cases exhibited p53 immunopositivity.

Conclusion : Our data therefore indicate that even in the so-called adamantinomatous group of craniopharyngiomas, several sub-groups with different clinical behavior patterns can be identified on the basis of differentiation markers relating mainly to the presence or the absence of RARβ and RARγ.

Pseudo-tumor cerebri due to a capillary hemangioma of the superior sagittal sinus in a child : case report. D. Morelli, B. Pirotte, I. Salmon, D. Baleriaux, G. Rodesch, J. Brotchi (Depts of Neurosurgery, Neuroradiology and Neuropathology, ULB-Hôpital ERASME, Brussels, Belgium).

Introduction : The so-called "Pseudo-Tumor Cerebri" (PTC) syndrome may have various causes not always easy to identify. Children are often maintained under empiric therapy including repeated lumbar punctures (LP) or oral acetazolamide°. We present a case due to a compression of the superior sagittal sinus (SSS) by an intracranial capillary hemangioma (CH).

Case history : This 10-year-old girl suffered from slowly progressive headaches. Fundoscopy revealed bilateral papilledema. First brain computerized tomography (CT) and magnetic resonance (MR) imaging including contrast/gadolinium injections, revealed neither intracranial lesion nor hydrocephalus. Cellularity and proteins in the cerebro-spinal fluid (CSF) were normal. The intrathecal pressure recorded by lumbar puncture in lying position rose up to 50 cm. Based on the diagnosis of idiopathic PTC, this girl was treated during 12 months with chronic oral Acetazolamide° (250 mg/day) and weekly LP that transiently reduced symptoms. In our department, detailed examination of the MR images individualized an abnormal narrowing of the SSS in its parieto-occipital portion. Multiplanar MR/angio-MR imaging and selective angiography showed a contrast-enhanced extradural 3 cm-lesion reducing the SSS lumen with no collateral venous adaptation. A second lesion was suspected near the straight sinus. Differential diagnosis included SSS thrombosis, giant arachnoid granulations, meningiomas, metastases, vascular tumors. Physical examination showed no sign of phacomatosis. Diagnosis of PTC due to venous impairment was raised. A microsurgical approach allowed subtotal removal of a soft tumor coming from right wall of the SSS, compressing/infiltrating the venous wall. The SSS lumen was reopened. All clinical symptoms and fundoscopic signs of intracranial hypertension disappeared. Histopathology revealed a benign CH. Postoperative MR imaging showed a stable (1-year follow-up) tumor remnant in the patent SSS ; the straight sinus went back to normal shape. No additional treatment has been performed.

Discussion : CH are commonly found on mucosal and cutaneous surfaces. They can develop in the retina or in the periorbital region where they can be a manifestation of von Hippel-Lindau disease. Spinal intradural extramedullary CH are reported. Contrast-enhancing intracranial meningeal-based masses can be rarely found with extracranial CH in rare vascular phacomatoses. As extracranial CH may regress spontaneously in the majority of cases, a conservative approach is recommended for presumed intracranial CH. Surgery should be avoided unless tumor growth is demonstrated. In our case, no cutaneous/mucosal CH was found and, except the SSS lesion, the suspected second lesion appeared to be a loop of the straight sinus probably due to raised venous pressure since it disappeared postoperatively. The postoperative improvement demonstrated relationship between intracranial hypertension and SSS compression.

Conclusion : Tumoral obstacle to the venous circulation, even rare, should be included in the differential diagnosis of the so-called PTC syndrome. Direct surgical approach may lead to normalization of the venous circulation and avoid permanent CSF shunt.

Primitive cerebral ganglioneuroblastoma with bone marrow metastases : a case report. K. Mostofi, B. De Coene, C. Godfraind, J. Kerger, C. Gilliard, T. Gustin (Departments of neurosurgery, radiology and oncology, Cliniques Universitaires UCL de Mont-Godinne ; Department of neuropathology, Cliniques Universitaires UCL Saint-Luc, Brussels).

Introduction : primitive cerebral ganglioneuroblastoma is extremely rare, especially in adults. Extracranial metastases originating from this tumor have never been reported.

Method : we describe the case of a 30-year-old man presenting a cerebral ganglioneuroblastoma and developing bone marrow metastases 8 years after initial diagnosis.

Case report : the patient was admitted in our hospital in 1993 after a generalized seizure. Brain MRI revealed a 4 cm tumor in the left parietal lobe. The lesion slightly enhanced after Gadolinium administration and contained numerous calcifications. Gross total resection of the tumor was then performed. Histological features were compatible with a diagnosis of OMS grade 3 ganglioneuroblastoma. Surgery was followed by standard fractionated irradiation.

The patient underwent reoperation in 1996, 1998 and 2000, because of tumor recurrence detected on control MRI. After the second and third surgery, multi-drug chemotherapy was also administrated. Histological examination showed transition to OMS grade 4.

In 2001, a fourth tumor recurrence was treated by stereotactic radiotherapy. 4 months later, the patient experienced increasing dorso-lumbar pain and a change in his general condition. Blood analysis revealed pancytopenia. Spinal MRI demonstrated diffuse vertebral bone marrow infiltration. Ganglioneuroblastoma cells were found in a bone biopsy sample harvested from the iliac crest. There was no other extracranial metastasis. Clinical, radiological and hematological stabilization was obtained with chemotherapy (Vincristine, Adriamycin, Dexamethasone).

Conclusions : this is the first report of a cerebral ganglioneuroblastoma with metastases to bone marrow. The long survival time of the patient has probably allowed late tumor dissemination. This case suggests also that malignant neuronal brain tumors must be treated agressively by repeated surgery. On the other hand, the role of radiation therapy and chemotherapy remains unclear.

Ischemic stroke after transsphenoidal surgery for cushing disease. V. SCORDIDIS[1], C. HERMANS[2], D. MAITER[3], C. RAFTOPOULOS[1] ([1]Department of Neurosurgery, [2]Department of Haematology, [3]Department of Neuroendocrinology, Cliniques Universitaires Saint-Luc, Bruxelles).

Introduction : Thromboembolic events are known complications in relation with glucocorticoid excess. Cerebrovascular complications are rare and postoperative infarction following transsphenoidal surgery has not been reported. Our objective is to detail an observation of postoperative supra- and infratentorial infarction and to emphasise the hypercoagulable state present in Cushing's disease.

Case Report : A 33 year-old woman with no medical past is admitted. She complains of amenorrhea, progressive weight gain and facial acne. She quit smoking 9 years ago. Physical examination shows 63 kgs, and 164.5 cm, lunar facies. Cardiac rhythm and arterial tension are normal. Biological investigations are normal except for hypercortisolemia and increased ACTH. Systemic complications of hypercorticism are noted : severe osteoporosis, mild myopathy and amenorrhea. MRI shows a macroadenoma extending into the right cavernous sinus. The patient will benefit of a transsphenoidal partial resection. Knowing the higher incidence of thromboembolic complications in Cushing's disease, the patient received preventive heparinotherapy and elastic stocking. Two days later, she complains of right arm disability and speech disorder. MRI shows a right cerebellar and left frontal ischemic stroke. All cardiovascular investigations are non-contributive. Hemostasis study shows a factor II mutation (present in 1% of population) as additional predisposing factor for thromboembolic disease. Fortunately, patient recovered fully.

Discussion : Transsphenoidal surgery for Cushing's disease has a higher complication rate (10%-20% with 1.8% permanent morbidity) than for other pituitary adenomas. The most common are deep vein thromboses or pulmonary thromboembolism (4%-11%). Our case illustrates an exceptional thromboembolic complication directly related to the hypercoagulable state of Cushings disease. Mechanisms of this state are defective nurmolytic potential, increased factor VIIII-IX-XI-XII activities level.

Conclusion : Brain ischemic stroke after transsphenoidal surgery for Cushing's disease is a possible complication even under preventive heparinotherapy.

Supratentorial "PNET" : a case report. J. VANGENEUGDEN, H. VAN DIJCK*, K. DE SMEDT, P. HERREGODTS, D. BERGHMANS, R. HERZ, V. DEBOIS (Department of Neurosurgery, A.Z. St. Maarten, Duffel ; Department of Neurosurgery, A.Z. St. Augustinus, Wilrijk ; *Department of Pathology, A.Z. St. Maarten, Duffel).

Introduction : Supratentorial Primitive Neurectodermal Tumors (PNETs) are a broad group of embryonal tumors. They are aggressive small cell, malignant neoplasms composed primarily of primitive or undifferentiated neuroepithelial cells. Differentiation of cells resembling neoplastic astrocytes, ependymal cells, neurons or melanocytes may be present to different degrees within the tumor. PNETs often spread by leptomeningeal dissemination. Beside surgery, craniospinal irradiation is recommended and eventually chemotherapy.

Methods : A 41-year-old, male patient presents after an epilepsy crisis. MRI shows a brain tumor, parietal left, suspected to be a glioma. Pathology shows, after surgical complete resection, a low-grade glioma, astrocytoma grade 2, in all examined specimens. Patient recovers well and a follow up with repeated MRI scans shows no signs of recurrence.

Two and a half-year later, recurrence is shown at the initial localisation. Contrary to the first resection, peroperatively there is no soft, homogenous gliotic tumor but a hard, hemorraghic tumor with cystic component, sharply defined borders and invasion of the lateral ventricle.

Results : Pathology shows a PNET with no glial nor neuronal differentiation. Craniospinal radiotherapy is planned but already 4 weeks postoperatively, a massive recurrence exists with leptomeningeal, supratentorial dissemination. Because of acute, subfalcine herniation, debulcking of the major part of the tumor is performed. The patient dies shortly after because of a new massive recurrence of the tumor.

Conclusion : Supratentorial PNETs are a well known entity of aggressive, malignant brain tumors. What makes this case special is its initial presentation as a low grade glioma and only two and a half years later the real manifestation of a PNET. MRI and pathology findings are shown ; recent literature is discussed.

The use of dermabond in neurosurgery. A. VAN GOETHEM, F. WEYNS, J. WUYTS, J. MONSTREY (Department of Neurosurgery, Ziekenhuis Oost-Limburg, Campus St.-Jan, Genk).

Introduction : The use of a new topical skin adhesive (Dermabond) for wound closure was evaluated in patients undergoing spinal surgery.

Methods : In 100 patients undergoing lumbar disc surgery and 50 patients with anterior cervical fusions, skin closure was performed with skin staplers or Dermabond. The patients were evaluated by questionaire and clinical follow-up during 3 to 6 months.

Results : Patient satisfaction was greater in the Dermabond group than in the skin staplers group. Patients treated with Dermabond were able to shower starting the second postoperative day and didn't need any medical woundcare postoperatively. Cosmetically, wound healing was superior in the Dermabond group. The use of Dermabond is faster than the use of intracutaneous sutures and less expensive than the use of skin staplers. No infections or wound problems were reported in either group.

Conclusions : Dermabond offers the spinal surgeon a fast and cost effective solution for cosmetically superior skin closure.

The external fixator of Magerl for the reduction of high grade lytic spondylolisthesis. P. VAN SCHAEYBROECK, P. VANDERSCHOT (Dept. of Neurosurgery and Traumatology, U.Z. Gasthuisberg, 3000 Leuven, Belgium).

Introduction : High grade lytic spondylolisthesis represents a challenge for surgical treatment and several techniques have been described to treat this disease, depending on anatomical presentation, patient age and severity.

Methods : We present the use of the external lumbar fixator of Magerl for the gradual reduction of high-grade lytic spondylolisthesis in the awake patient. This is the first step before definitive fixation. This fixator was primarily developed for use in traumatic lumbar fractures and in some series used to reduce spondylolisthesis in children and young adults. We describe a case of grade III spondylolisthesis in a 32-year-old woman.

Results : We achieved successful albeit partial reduction over 5 days of gradual correction with the external fixator. This allowed us to perform in situ anterior and posterior fixation in two stages. We discuss the technical aspects, advantages and disadvantages of this technique.

Conclusion : The external fixator of Magerl is a useful tool to reduce high-grade lytic spondylolisthesis and has the advantaae that reduction can be performed in the awake patient while neurological parameters can be controlled.

Spinal cord stimulation in refractory angina pectoris : preliminary experience. B. PIROTTE, N. PREUMONT, Ph. VOORDECKER, J. L. JANSSENS, E. STOUPEL, A. VANDESTEENE, J. BROTCHI (Depts of Neurosurgery, Anesthesiology, Cardiology and Cardiac surgery, ULB-Hôpital Erasme, Brussels, Belgium).

Introduction : The treatment of *Angina Pectoris* (AP) as a symptom of coronary artery disease is usually focused on restoring the balance between oxygen demand and supply of the myocardium by drugs or revascularisation procedures. Patients not responding to adequate medication and not suitable anymore for revascularisation, are considered to suffer from refractory AP (rAP). For these patients with a poor quality of life and severely afflicted exercise tolerance, spinal cord stimulation (SCS) has been described repeatedly as an effective and safe therapy creating direct pain-inhibiting effect but also reduction of the underlying ischaemia.

Methods : Two patients (F65 ; M66) suffering from rAP were implanted with SCS according to a protocol recently published by others *(Heart 1999, 82 : 82-88).* Patient selection criteria were : chest discomfort during minimal exercise despite maximal tolerated antianginal drug therapy (at least 2 out of a beta-blocker, calcium-antagonist or long-acting nitrate). Extensive clinical evaluation excluded non-cardiac causes of chest discomfort. Both patients had multivessel diffuse artery disease, considered in multidisciplinary staff as not suitable for revascularisation. They experienced one or more myocardial infarctions but had normal/slightly altered left ventricular function. Patient 1 suffered for 2 years with restricted walking perimeter (30 m). She had previously undergone transmyocardial laser revascularisation therapy with transient improvement during 4 months. Patient 2 suffered from AP for 20 years and was operated of coronary artery bypass grafting in 1982 and 1991. A quadripolar electrode (Quad°, Medtronic, Minneapolis) was percutaneously implanted epidurally at the Th1 level. Fluoroscopy under local anesthesia helped to ensure adequate electrode positioning

on the midline. Additionally, ideal electrode positioning was confirmed by projection on the precordial region of paresthesia induced by bipolar stimulation. During a four-week period, patients were stimulated one hour every 4 hours during the day using external stimulator. Clinical assessment included quantification of mean nitrate consumption/week, mean AP attacks/week, mean duration of AP attacks and walk test perimeter.

Results : Both patients described a dramatic improvement of their quality of life during the four-week stimulation-period : mean AP attacks/week decreased (from 10 to 2 in patient 1, from 5 to 2 in patient 2) with substantial reduction of nitrate consumption. Mean duration of AP attacks also decreased (from 20 to 10 minutes in patient 1, from 15 to 10 minutes in patient 2). In patient 1, walk test performed before implantation was stopped after 30 m by AP attacks with concomitant EKG changes. Under SCS, walk test perimeter improved to 100 m but remained limited by AP. Unfortunately, this patient died ftom cardiogenic shock during anesthetic induction prior to definitive stimulator implantation, after external stimulation had been stopped for many days. Patient 2 was additionally evaluated by exercise stress testing : SCS allowed to reach longer distance with higher myocardial oxygen consumption.

Conclusions : This preliminary experience showed the dramatic efficacy published on rAP in terms of improvement in quality of life, exercise capacity, reduction of AP attacks and nitroglycerin intake. As soon as its safety is sufficiently established, SCS might become, in selected patients, an attractive additional therapy of rAP in Belgium.

True frameless stereotactic biopsie : analysis of the first 10 consecutive cases. K. Engelborghs, G. De Mulder, T. Van Havenbergh, D. De Ridder, J. Verlooy (Department of Neurosurgery, University Hospital Antwerp, Belgium).

Objective : Advances in frameless stereotaxis, or neuronavigation, simultaneously with the introduction of instrument holders, facilitate the use of frameless techniques in stereotactic biopsy procedures, that is, procedures in which an instrument is guided toward a single predefined target. Between August 2001 and December 2001, 10 patients with cerebral mass lesions in which a stereotactic biopsy was warranted for the purpose of pathological diagnosis underwent a frameless procudere.

Methods : A freely moving mechanical guidance tube holder (Metronic STN©) mounted on a Mayfield clamp and an optically tractable biopsy needle (Metronic STN©) was integrated into a neuronavigation system (StealthStation Mach 4.0©). After a Patient-to-image registration (MRI or CT based), a biopsy trajectory was pre-operatively planned to avoid critical structures. Under general anesthesia a standard biopsy procedure was performed with the exception that the vital three-dimensional accuracy, i.e. the direction and the required needle insertion depth, was interactively calculated by the system.

Results : In all patients pathological brain tissue was obtained allowing an anatornopathological diagnosis.

N = 10	Median	SD
Age	58	14.8
Lesion diameter (mm)	16.4	12.3
Distance to lesion (mm)	30.9	16.6
Localisation Supra/infratentorial	8/2	

The post-operative CT-scans showed no deviation of the predefined trajectory or hematoma formation.

Conclusions : We consider the framelless method a valid alternative. Relative advantages are the improved diagnostic image presentation, target selection and simplicity. The reduced discomfort for the patients and moreover, the versatility during the procedure – possibly leading to an increased yield rate – support its use in preference to frame-based biopsy techniques. We encountered no practical drawbacks, nor a procedure related increase in complication rate.

Noncoplanar circular arcs versus dynamic arc shaped beam radiosurgery with mMLC in AVMs : we also report our preleminary results of 19 patients treated with conventional linac radiosurgery. G. Koerts[1], D. Verellent[2], K. Van Rompaey[1], R. Ates[1], C. Chaskis[1], J. D'haens[1] (Department of [1]Neurosurgery and [2]Radiotherapy, AZ-VU Brussels).

Introduction : Stereotactic radiosurgery has been applied to cerebral AVMs for many years as primary treatment modality or secondary after endovascular embolization or surgery. AVM's are often located on surgical inaccessible structures or in eloquent brain areas. Due to their irregular shapes, radiosurgery with circular collimators or gamma-knife has become a challenge. To avoid complications of radiosurgery many efforts have been taken to deliver homogenous doses on the target while minimizing the dose to normal brain and adjacent critical structures. We compare the dose distributions with the classic approach of noncoplanar circular arcs and dynamic arc shaped beam radiosurgery. We also report our preliminary results of 19 patients treated with conventional linac radiosurgery.

Methods and materials : Conventional radiosurgery performed with conical collimators can only approximate the shape of a lesion. In dynamic arc shaped beam radiosurgery technique a micro-multi leaf collimator is attached to a linear accelerator. This beam-shaping device rotating around the patient delivers continuous radiation while the shape of the beam is constantly changing. We selected two types of representative cases from prior radiosurgical treatment. We simulate two treatment plans (circular arcs with multiple isocenters and shaped beam single isocenter radiosurgery) for targets (AVMs) of different size and irregularity. In all plans the same dose was given on the margin of the tumor for better comparison. The goal of both plans was to deliver a high isodose level on the contour of the AVM and a steep dose fall-off to protect surrounding brain and critical structures.

Nineteen patients out of forty had a control angiography two years after radiosurgery and were retrospectively reviewed. They were all treated in our center with classic noncoplanar arcs and conical collimators.

Results : Dose-volume histograms clearly show the dose distributions in the targets and surrounding brain for the two different treatment plans. Multiple isocenter plans (circular arcs) give dose heterogeneity in the target Dose-Volume Histogram. For a small regular shaped AVM both techniques spare the surrounding brain in an equivalent manner. In the case of an irregular shaped AVM, dynamic arc beam shaped radiosurgery still delivers homogenous doses on the target and is superior in sparing normal brain.

Of the 19 patients treated in AZ-VUB the overall 2-years obliteration is 74%. Two patients underwent staged treatment for a large AVM. One of them died from a rebleeding. Excluding these two makes an obliteration rate of 82%. A few patients developed treatment related complications like radiation induced necrosis, late cyst formation or hemiparesis.

Conclusions : Dynamic arc beam shaped radiosurgery is a single isocenter technique with excellent dose homogeneity within the target and at the same time sparing surrounding structures. With this technique, we expect to increase tumor control and to avoid treatment related complications, especially in irregularly lesions like AVMs.

Gamma knife radiosurgery for intractable trigeminal neuralgia : evaluation of prognostic factors. N. Massager, A. Joffroy, D. Devriendt, Ph. David°, J. Lorenzoni, F. Desmedt, J. Brotchi, M. Levivier (Gamma Knife Center & Department of Neurosurgery, and Department of Radiology, Université Libre de Bruxelles, Hôpital Erasme, Brussels, Belgium).

Introduction / objective : Leksell Gamma Knife® (LGK) radiosurgery is an increasingly used and the least invasive surgical option for patients with medically refractory trigeminal neuralgia (TN). Although series of patients with TN and treated with LGK have been recently reported in the literature, little is known about the preoperative factors associated with a good outcome. The aim of the present study is to evaluate the prognostic factors of this approach.

Material and methods : Between December 1999 and January 2002, we have treated 333 patients with the first worldwide installed LGK C. This included 43 patients with intractable TN (13% of all treated patients). Median age was 65 years. Thirty-six patients had essential TN ; 2 had postoperative TN ; and 2 had TN associated with multiple sclerosis (MS). Pain location was V1, V2 and/or V3 for respectively 20, 36 and 16 patients. Sixteen patients (40%) had a history of one or several previous other surgical treatments. A vascular loop in close relation with the trigeminal nerve was visualized on MR in 28 of the 40 patients (70%). All patients were treated with a single 4 mm isocenter targeting the distal portion of the cisternal part of the trigeminal nerve (as close as possible to the plexus triangularis). A maximal dose of 80 to 90 Gy was administered (most patients were treated with a standard dose of 90 Gy).

Results : For 19 patients, a clinical and radiological follow-up of minimum 6 months was available. Contrast enhancement of the nerve at the target was found on the 6-months post-operative MRI in 13 patients (68%). Pain reduction at 6 months post-LGK was 100% for 12 patients (63%), > 90% and < 100% for 3 patients (16%), and 0% for 4 patients (21%). In 1 patient, the trigeminal pain recurred after a 9-months pain-free period. Of the 15 patients with good pain control, 5 have decreased their oral medication and 3 have stopped all medication at the last follow-up. Four patients developed mild facial hypoesthesia ; no other post-operative morbidity was noted. A vascular conflict was found in 13 of the 15 patients (87%) with good post-operative pain control ; only 1 patient (25%) with failed post-operative pain control had a vascular loop on MR. Contrast enhancement on the nerve after irradiation was found in 9 of the 15 patients (60%) with good pain outcome, and in 3 of the 4 patients (75%) with no pain reduction. Both patients with MS had no control pain. Seven of the 15 patients (47%) with good pain outcome and 2 of the 4 patients (50%) with no pain control had previous surgery.

Conclusions : Excellent pain control (> 90%) was found in 79% of the patients 6 months after LGK radiosurgery. Presence of a vascular conflict on MR is not a contra-indication of LGK ; on the contrary, the presence of a vascular loop seems related to good pain control after LGK. In our expenence, TN associated with MS is not improved after LGK. A history of previous surgery, and a lack of contrast enhancement on the post-operative MR are not related to the clinical outcome.

(Supported by F.N.R.S., Loterie Nationale, and Ministère de la Politique Scientifique).

Gamma knife radiosurgery for vestibular schwannoma : early experience with an emphasis on hearing preservation. M. Levivier, C. Delbrouck[1], N. Massager, P. David[2], D. Devriendt, F. Desmedt, J. Brotchi (Gamma Knife Center & Department of Neurosurgery, [1]Department of ENT, [2]Dept of Radiology, Université Libre de Bruxelles, Hôpital Erasme, Brussels, Belgium).

Introduction / objective : Radiosurgery is an alternative to the microsurgical resection of vestibular schwannoma (VS). It has gained acceptance and is increasingly used because it his associated with lower morbidity while offering a high rate of long-term tumor control. Here, the goal is to report our experience with Leksell Gamma Knife® (LGK) radiosurgery in the management of VS, and to evaluate our early results as compared to those obtained in centers with long-term experience.

Material & methods : Since December 1999, we have treated 333 patients with the first worldwide installed LGK C. This included 71 patients with VS (21% of all treated patients). There were 62 patients with previously untreated VS (15 grade I, 20 grade II, and 27 grade III, according to Koos) and 9 patients with postoperative evolutive residual tumor. The target volume ranged from 11 to 7500 mm^3 (mean : 1244 mm^3) and the marginal dose from 12 to 14 Gy (although most patients, especially those with pre-operative useful hearing, were treated with a standard dose of 12 Gy). The hearing was assessed (according to Gardner-Roberson classes (GR), based on pure tone average and speech discrimination) the day before, as well as 6 weeks, 6 months and 1 year after LGK. Follow-up MR were scheduled 6 months and 1 year after radiosurgery. The patients are then followed on a yearly basis.

Results : Before LGK, 32 patients had useful (23 GR class 1 and 9 GR class 2), 15 had serviceable (GR class 3), and 24 had non-useful hearing (2 GR class 4 and 22 class 5). Thirty-two patients were treated more than 1 year ago, and detailed data were available in 29 of them (91%). Among the 18 patients with useful hearing before LGK, 13 (72%) retained the same hearing level and 3 turned to GR class 3 ; thus, altogether 16 patients (89%) had still serviceable hearing one year after LGK. Among the 11 other patients, there was no change in hearing, except in one, that improved from GR class 5 to 3. In the entire series, there was no tumor growth or new neurological deficit. A few patients experienced worsening of previous tinnitus or vestibular syndrome. Similarly, only one patient with residual facial weakness after previous surgery experienced deterioration. No patient developed trigeminal neuropathy. MR showed loss of gadolinium enhancement in the center of the tumor that was clearly visible in most cases (except in grade 1) at 6 months after radiosurgery.

Conclusions : Compared to results obtained in centers with long-term experience, our data suggest that radiosurgery performed with LGK is a safe, efficient and reproducible therapeutic approach for the management of VS grade I to III, as well as in cases of residual tumor after microsurgery. There is virtually no morbidity and the chances of hearing preservation are high. This justifies the choice of LGK radiosurgery as the first treatment option in these cases. Longer term follow-up will be needed to confirm these data as well as tumor local control and size reduction.

(Supported by F.N.R.S., Loterie Nationale, and Ministère de la Politique Scientifique).

Experience with the vertical hemispherotomy according to Delalande : preliminary results. B. Noens, J. Van Loon, L. Lagae[1], J. Goffin (Departement of Neurosurgery and [1]Neuro-Pediatrics, University Hospital, Leuven).

Introduction : Patients with structural abnormalities restricted to one hemisphere (hemimegalencephaly, Sturge-Weber syndrome, Rasmussen's encephalitis, perinatal cerebral vascular occlusion) and refractory epilepsy are no candidates for resective surgery. To avoid the complications of a hemispherectomy, several authors developed their own technique to perform a hemispherotomy.

Materials and methods : In 4 patients a hemispherotomy according to Delalande was performed. Age ranged from 6 months to 17 years. They all had pharmacoresistant epilepsy. Three patients had structural deformaties in one hemisphere (2 right sided and 1 left sided) due to perinatal asphyxia, with clinical and electrophysiological convergence. The youngest patient had the typical radiological presentation of a right sided hemimegalencephaly with polymicrogyri and other migrational disorders.

Results : Follow up ranged from 1 month to 13 months. One patient suffered from an aseptic meningitis during the postoperative hospital stay. No patient needed a temporary or permanent ventricular shunting.

Both patients with a longer follow up (8 months and 13 months) were postoperative completely seizure free. In both there was a transient deterioration of the preoperative hemiparesis.

Nevertheless the amelioration of the psychomotor development was significant with an important influence on the verbal capacities.

The follow up period of one month in the two other patients is to short to make valid conclusions.

Conclusions : The vertical approach according to Delalande seems an elegant and efficient technique in helping a small portion of patients with refractory epilepsy caused by a diffuse pathology in one hemisphere. Further follow up in our patients is needed to validate and confirm the initial good results.

Dendritic cell vaccination for malignant gliomas : from the laboratory to the clinic. S. De Vleeschouwer[1,2], F. Van Calenbergh[1], S. Van Gool[2] and C. Plets[1] (Department of [1]Neurosurgery and [2]Laboratory for Experimental Immunology, University Hospital Gasthuisberg, Catholic University Leuven).

Objectives : To investigate the feasibility of eliciting a specific immune response against glioblastoma cells in an in vitro human glioblastoma model, and in patients with recurrent malignant glioma, using the dendritic cell (DC) technology.

Methods : We developed a model for testing cytotoxicity of human T cells (both from healthy donors and patients), primed by pulsed autologous dendritic cells, against established glioblastoma cell lines and autologous tumor cells. Dendritic cells are generated out of peripheral blood monocytes and pulsed with whole tumor material. Early passage cultures were established from patients with histologically proven malignant glioma.

Using a similar technology, DC vaccines were prepared for vaccinating patients with minimal residual disease after re-operation for recurrent malignant glioma. Clinical, radiological, immunological and PET monitoring of the patients is organized.

Results : In vitro results show that a cytotoxic immune response can be elicited using the DC vaccination technology both in healthy donors and patients.

DC vaccination as adjuvant therapy for patients with minimal residual disease after re-operation for a recurrent malignant glioma is feasible. No acute toxicity was noted. The clinical, radiological and PET monitoring for a period of 6 months follow-up in a first patient seems promising. A second patient has recently been enrolled in the trial.

Conclusion : A cytotoxic T cell response against (autologous) human glioblastoma cells can be achieved using the dendritic cell technology. Preliminary clinical experience with patients shows that DC vaccination is feasible, safe and promising.

Surgery of petroclival tumors : how to choose the best approach. L. F. De Waele, G. Alessi, B. D'haen, H. Colle (Department of Neurosurgery, A.Z St. Lucas, Ghent, Belgium).

Introduction : Lesions of the petroclival (P.C.) region can be adressed by many approaches. The deep location and complex anatomy provide a true challenge to the neurosurgeon to resect these lesions with a minimum of morbidity.

General principles : P.C. tumors may become very large and extend into middle fossa, tentorial incisura, cerebellopontine angle, internal auditory canal, jugular foramen and extracranial spaces.

The optimal. strategy for surgical treatment of P.C. tumors is still unclear.

Decision making – approaches : Recently attention has been paid to the postero lateral approaches to this region :

– extended middle fossa approach
- middle fossa approach (rhomboid fossa)
- combined petrosal approach.

These approaches share in common a subtemporal craniotomy with a varied degree of removal of the petrous bone from the posterior and middle fossa trajectories, while maintaining all neuro-otological structures.

Accurate clinical and radiological investigations are essential to draw the surgical plan : CT.scan, MRI, Superselective angiogram, venogram and balloon occlusion test.

Tumor in zone I : temporal craniotomy and anterior petrosectomy will gain access to this zone. The cochlea under the geniculate ganglion (G.G.) can be drilled to gain a wider surgical window.

Tumor in zone II : presigmoïd approach with a posterion petrosectomy will provide access to this zone (a labyrintectomie can be included if patient is already deaf).

Tumor in zone III : far lateral "ELITE" approach has to be performed to have succesfull removal.

Conclusion : Tumors of the petroclival region can be adressed by many approaches. The author illustrates which surgical appraoch is the best for various tumor locations.

Retrosigmoid approach to the posterior cranial fossa : an anatomical study. T. Tousseyn, J. Van Loon, F. Van Calenbergh, C. Plets (Department of Neurosurgery, University Hospitals Leuven, Belgium).

Introduction : Several approaches to the posterior cranial fossa involve exposure of the transverse and sigmoid sinuses to prevent unnecessary retraction of the cerebellum. On the other hand iatrogenic damage of the sinuses may lead to bleeding and air embolism. Therefore knowing the location of the sinuses based on the superficial surgical anatomy may be helpful.

Methods : In 30 specimens (yielding 60 sides) the relationship of bony landmarks and sutures overlying the region of the transverse and sigmoid sinuses was examined as an aid to the appropriate placement of the cranial opening for the retrosigmoid approach to the posterior fossa.

Results : The triangle formed by the asterion, the mastoid emissary foramen and the junction of the squamosal and parietomastoid sutures proved to be a useful landmark to localise the transverse-sigmoid junction. The mastoid emissary foramen is always located at the lower and medial border of this junction. Therefore making a burrhole at the medial and inferior margin of the foramen safely exposes the transverse-sigmoid junction.

Conclusions : The mastoid emissary foramen is a reliable and readily recognizable superficial landmark. The method described seems to be easier and more accurate than methods proposed in the literature using reference points at a distance.

Primary cerebral lymphoma. A retrospective study of 32 patients. A. DUBUISSON[1], B. KASCHTEN[1], J. LENELLE[1], D. MARTIN[1], P. ROBE[1], M.F. FASSOTTE[2], I. RUTTEN[3], M. DEPREZ[4], A. STEVENAERT[1] (Departments of [1]Neurosurgery, [2]Hemato-oncology, [3]Radiotherapy, [4]Neuro-pathology, C.H.U. Liège).

Introduction : Primary cerebral lymphoma (PCL) is an increasingly frequent tumor being recognized by neurologists and neurosurgeons.

Methods : We retrospectively analyzed 32 cases of primary cerebral lymphoma, diagnosed between 1987 and 2002.

Results : There were 17 men and 15 women whose mean age at diagnosis was 67 years (range 34-83). Three patients were immunodeficient (1 HIV +, 2 with prior immunosuppressive therapy). The most common presenting symptoms were focal deficit (n = 15) and cognitive disturbances (n = 14) ; 3 patients suffered from uveitis concomitantly or many years before PCL ; one patient presented in coma.

Radiological examination was obtained by CT Scan (n = 27) and/or MRI (n = 27) : 18 patients had deep-seated lesions, 12 (sub)cortical and 2 both superficial and deep tumors. Multifocality was observed in 8 cases. The diagnosis was preoperatively suspected in 16 patients ; the first preoperative diagnosis was primitive brain tumor (n = 5), metastatic brain tumor (n = 5), vasculitis (n = 1), toxoplasmosis (n = 1) and undetermined (n = 4) in the remaining 16 patients. All but 2 patients underwent histological diagnosis by craniotomy (n = 11) and/or stereotatic biopsy (n = 23) ; diagnosis was obtained on CSF cytology in one patient with a third ventricle tumor ; in the last patient, who had received preoperative corticotherapy, the diagnosis was based solely on strong evidence by MRI despite 2 negative histological examinations. On histology, 31/32 cases were lymphomas, usually of high grade and of B cell type.

Treatment included surgical resection (n = 10), chemotherapy (n = 23) and/or radiotherapy (n = 10). At the completion of therapy, 9 patients had died (1 to 8 weeks after diagnosis), 12 patients were in complete remission, 3 in partial remission. Response to treatment is unknown for 8 patients, including 4 under chemotherapy in January 2002. At the time of last contact, one patient was in terminal phase, and 21 patients had died (3 early postoperative deaths, 4 early deaths while under chemotherapy, 2 early deaths of non-treated patients, 4 recurrent lymphomas, 8 progressive neurological deteriorations). Four patients are being treated ; only 4 patients are alive and well at 14, 42, 45 and 46 months after diagnosis.

Conclusions : Primary cerebral lymphoma is being increasingly recognized in both immunosuppressed and immunocompetent patients. Reasons for this are unclear. The diagnosis should be raised when a deep-seated or multifocal brain lesion develops in an elderly or immunosuppressed patient. In recent years, the treatment scheme has usually consisted in chemotherapy alone since association of radiotherapy to IV and IT chemotherapy led to severe leucoencephalopathy in elderly patients. However, recent data from literature prompt us to reanalyze the best way to combine these different therapeutic modalities.

Tectal plate gliomas : apropos of three cases. K. VAN ROMPAEY, G. KOERTS, R. ATES, C. CHASKIS, J. D'HAENS (a.z.-v.u.b.).

Introduction : Tumors involving the tectal region of the midbrain may have an indolent clinical course. However the close proximity to the aquaduct of Sylvius is responsible for the occurrence of hydrocephalus in the early clinical course. The natural history, management and long-term outcome remain controversial. Most authors consider these tectal plate tumors as "bening" and recommand a conservative management.

Material and methods : We report three cases of midbrain tectal plate lesions. The age at time on admission was 19 months, 14 years and 40 years. Presenting symptoms included transient diplopia, the Nothnagel syndrome (ocular palsies, paralysis of gaze and cerebellar ataxia) and intracranial hypertension.

All patients presented with triventricular hydrocephalus and tectal distorsion on CT-scan. Magnetic resonance (MR) imaging showed delineated intra-axial mass lesion of the midbrain centered to the tectal plate with hyperintens T2-weighted images with a more variable appearance on T1-weighted-scans. All enhanced with Gadolinium. MR imaging allowed us to choose the most appropriate surgical approach.

All three patients underwent initially cerebrospinal fluid diversion, (2 internal and 1 external) and subsequently surgical resection. We have chosen to place the patients in the concorde position and to use the infratentorial supracerebellar route in all cases because the lesions where limited entirely to the midbrain. The tumor appeared well delineated from the surrounding tissue allowing a complete removal in all cases.

Results : The histological diagnosis was pilocytic astrocytoma in two and grade II astrocytoma in one. Patients improved postoperatively with recovered brainstem deficits in all cases. The follow-up period was respectively 5, 9 and 22 months. The patient with astrocytoma grade II showed asymptomatic mild tumor progression on MRI 15 months after surgery and received fractionated stereotactic radiotherapy.

Conclusion : The treatment of tectal plate gliomas remains controversial. We consider the tectal plate as a relativily safe territory for surgery. Even in these cases long-term follow-up with serial MR imaging is recommanded.

Aggressive therapy prolongs survival of patients with low grade glioma with a high FDG uptake. N. Oulad Ben Taib[1], F. Branle[2], S. Rorive[3], S. Goldman[4], J. Brotchi[1], O. De Witte[1] (Departments of [1]Neurosurgery, [2]Oncology, [3]Pathology and [4]Cyclotron Unit).

Introduction : High uptake fluoro-deoxy glucose (FDG) on PET scan represents a prognostic factor for low grade glioma (LGG). Since 1996, all the patients with a LGG were evaluated with FDG. An aggressive therapy (surgery, radiation therapy and chemotherapy) was proposed when an uptake of FDG was seen on PET scan. We report our results with this management of LGG.

Population : Fifty-six patients with a mean age of 41 (range, 19 to 70) years, with a LGG were evaluated with PET-FDG. PET was performed in all patients before any treatment. Histology was confirmed in all the cases. The follow-up consisted in PET scan, MRI and clinical examination and was from 6 to 120 months (mean : 37 months). We evaluated the survival of all the patients and focalized on those with a high uptake of FDG, and we compared those treated and not treated.

Results : Twenty-nine patients had a high uptake of FDG. Among them, twelve patients refused treatment (surgery, radiation or chemotherapy). The seventeen others have PET guided surgery or chemotherapy (procarbazine, vincristine, CCNU) or both. Eight patients died during the follow-up period. Survival curves of both groups are statistically different (log rank test : $p = 0.0017$) with a better survival for the treated patients.

In addition, no statistical difference was found between the survival curve of treated patient's (PET+) and patients with no uptake at all (PET-).

Conclusion : Therefore patients, with LGG and FDG uptake on PET scan, must be treated more aggressively (with surgery PET guided or chemotherapy) for a longer survival time.

Non-traumatic acute subdural haematomas : a consecutive series of 13 patients. B. Depreitere, J. van Loon, B. Nuttin, F. Van Calenbergh, J. Goffin, C. Plets (Dept. of Neurosurgery, University Hospital Leuven).

Objectives : Non-traumatic acute subdural haematomas (ASDH) are rare. Possible causes are : aneurysm rupture, arteriovenous malformations, coagulation disorders, tumors or dural metastases and cerebrospinal fluid shunts. The term spontaneous ASDH has been reserved for those cases in which no apparent cause could be demonstrated. Almost all patients with a spontaneous ASDH reported in the literature needed an emergency craniotomy and most authors report that the bleeding came from a torn cortical artery. We present a retrospective analysis of the non-traumatic ASDHs in our hospital between 1995 and 2001.

Methods : All patients with an ASDH that were seen in our department from January 1st 1995 to December 31st 2001 were traced. For those cases that were not considered to be traumatic, the scans and medical files were studied.

Results : During the defined period, 191 patients with an ASDH were treated in our department. In 13 patients (6,8%) there was no history of trauma. The mean age of those patients was 68.5 years. Nine of them had a coagulation deficit, which was iatrogenic in 7 cases. A craniotomy was done in 5 of those patients, the others being in a neruological state considered too bad. One patient developed a left-sided ASDH 5 days after a left medial cerebral artery infarction. He died soon after diagnosis.

In the other 3 patients, no cause was found. Two complained of headaches some days before the acute event. Two had arterial hypertension. Two patients presented with sudden neurological deficit and in both, a craniotomy was done and a bleeding cortical artery was found. One of these patients died, the other made a good recovery. The third patient, a 68-year old female, presented with a thunderclap headache and a temporary hemiparesis. She recovered spontaeously after some hours. The angiogram was negative. The haematoma became hypodens and was evacuated via burr holes after 12 days because of increasing mass-effect. She remained without neurological deficits all the time.

The in-hospital mortality of the 13 patients was 61,5% (8/13).

Discussion : Non-traumatic ASDHs represented only 6,8% of ASDHs in our hospital and most resulted from coagulopathies. Three patients (1,6%) caff be considered as having had a spontaneous ASDH, and in two of them an arterial cause of bleeding could indeed be identified. The clinical course of the 68-year old female patient was peculiar, in that the symptoms caused by the ASDH disappeared withoud treatment. In general, the outcome of non-traumatic ASDHs is not better than that of ASDH associated with head injury.

Optic nerve protection in orbitozygomatic craniotomies. D. De Ridder, T. Van Havenbergh, B. Kegelaers[1], G. De Mulder, K. Engelborghs, J. Verlooy (University Hospital Antwerp and [1]H. Hart Hospital Lier, Belgium).

Introduct ion : Sellar and parasellar lesions often present with opthalmological symptoms. Orbitozygomatic approaches are routinely used for these kind of lesions, more for brain protection than optic nerve protection. The optic nerve is especially vulnerable to traction or other iatrogenic trauma due to its histological structure.

Methods : Based on clinical cases a 4-stage optic nerve protection method is presented in orbitozygornatic craniotomies. For each stage an exemplary case illustration is given.

Results and discussion : Stage 1 : a standard orbitozygomatic (OZ) approach creates more working space around the optic nerve than a classic pterional approach especially at the distal part of the nerve, thus minimalizing the risk for iatrogenic trauma (case 1, craniopharyngioma)

Stage 2 : extending the OZ approach extradurally by removing the anterior clinoid and the optic strut results in better visuability of the proximal part of the nerve, at the nerve's exit from the orbit (case 2, ophthalmic aneurysm).

Stage 3 : as the optic nerve is still fixed in the dural ring, retraction at this stage can be greatly enhanced by transsecting this dural ring either from extradurally or intradurally. This is important if working pre-hypothalamicly, inferior to the optic chiasm (case 3, anterior clinoid meningioma).

Stage 4 : in selected cases, if the patient's vision is very impaired and he has visual field defects, the optic chiasm can be split surgically, creating an unseen manoevrability for the optic nerve and allowing much more retraction (case 4, craniopharyngioma).

Creating more working space around the optic nerve (stage 1 and 2) makes surgery easier and thus safer. Loosening the optic nerve from its fixation points to the dura (stage 3) or the chiasm (stage 4) allows it to be retracted more and safer.

Conclusions : Optic nerve protection in OZ craniotomies can be enhanced by modifying the craniotomy allowing more extensive surgery with less risk for visual impairement.

5-year experience of aneurysm coiling. H. Fransen[1], G. Allesi, B. D'haen[2], H. Colle[2], L. F. De Waele[2] ([1]Dienst Interventionele neuroradiologie, [2]Dienst Neurochirurgie, AZ Sint-Lucas, Groenebriel 1, 9000 Gent).

Introduction : During five years, 68 patients with intracranial aneurysm were treated with (Guigliemi Detachable Coils) GDC coiling.

We contribute our GDC experience with acute intracranial haemorrhage management and revealed our results and clinical outcome depending on the acute morbidity and Glasgow scaling.

Methods : Behind the technical problems and failures, clinical indications, pre- and postoperative management were discussed. The aneurysms were treated with an endovascular approach under 3D angiographic guidance. An exact placement of the coils with coaxial intra-aneurismal catheter placement was performed under fluoroscopic guidance. The importance of neck filling will be stressed.

Results : A brief outcome and result is given comparing the literature and the classical clipping technique.

From may 1996 to November 2001 127 aneurysm were treated either by GDC-coilling (n = 68) or surgical clipping (n = 59). We revealed a > 95% first stage coil packaging with 5% recanalisation of the cases : Aneurysmrupture (n = 2), coil rupture (n = 2), embolic stroke (n = 4), Spasm (n = 3), Migration (n = 0), reperfusion (n = 10), reintervention 5% operation (n = 2).

Conclusion : Our purpose of this review is to prove that, after technical improvement and several years of clinical experience, this technique is not only a useful tool but also an accurate new therapy in the treatment of intracranial aneurysm.

Keywords : Coiling, cerebral aneurysm, aneurysm rupture.

Characterization of the level of expression of S100B, S100A1, S100A2, S100A4 and S100A6 calcium-binding proteins in a rat model of cerebral basilar artery vasospasm. F. Lefranc[1], J. Golzarian[2], O. Dewitte[1], R. Pochet[3], C. Heizmann[4], C. Decaestecker[3], J. Brotchi[1], I. Salmon[5], R. Kiss[3] (Departments of [1]Neurosurgery, [2]Radiology and [5]Pathology, Erasmus University Hospital ; [3]Laboratory of Histopathology, Faculty of Medicine ; Free University of Brussels ; Brussels, Belgium ; [4]Division of Clinical Chemistry and Biochemistry, Department of Pediatrics, University of Zürich, Zürich, Switzerland).

Introduction : Subarachnoid hemorrhage (SAH) induces severe neurological morbidity and mortality. It has recently been argued that modifications in the levels of expression of some intracellular signalling elements controlling the organization of the actin cytoskeleton (including the RhoA small GTPase and its related kinases) play significant roles in the induction of smooth muscle cell contraction, a calcium-dependent process which is pathognomic of SAH-induced

vasospasm at molecular level. Several members of the calcium-binding S100 protein family are known to exercise a significant control over the organization of the actin cytoskeleton. The levels of expression of S100 proteins have never been investigated in SAH-induced vasospasm.

Material and methods : We therefore made use of a «double hemorrhage» rat model of SAH-induced vasospasm to investigate whether the immunohistochemical levels of expression of S100B, S100A1, S100A2, S100A4 and S100A6 proteins were significantly modified in this pathology.

Results : The quantitative determination of this immunohistochemical expression (carried out by means of computer-assisted microscopy) revealed that SAH-induced vasospasm is accompanied by a very significant increase in S100B, S100A2 and, to a lesser extent in S100A4 and S100A6 expression, whereas SAH-induced vasospasm is not accompanied by any significant modifications to S100A1 expression. Such significant modifications to the levels of expression of different members of the S100 protein family in SAH-induced vasospasm could relate to the various roles played by this specific class of calcium-binding proteins at the level of actin cytoskeleton organization.

Conclusion : These modifications to S100 protein expression seem relatively specific to SAH-induced vasospasm since heparin-induced epilepsy-like symptoms were accompanied by dramatically distinct profiles of S100 protein expression.

Cerebral microdialysis during temporary arterial clipping in cerebral aneurysm surgery. J. WUYTS, F. WEYNS, J. MONSTREY, C. DE DEYNE (Department of Neurosurgery, Ziekenhuis Oost-Limburg, Campus St.-Jan, Genk).

Introduction : The use of temporary arterial occlusion during microsurgical dissection of middle cerebral artery aneurysms causes the risk of focal infarction secondary to the induced reversible arrest of local arterial flow. In this study we used cerebral microdialysis to monitor early indicators of local brain ischemia during temporary clipping.

Patients and methods : A microdialysis probe was inserted into the parenchyma of the vascular territory of the MCA in a series of 5 patients. Extracellular concentrations of glucose, lactate, pyruvate and glycerol were measured.

Results : Temporary occlusion was applied for a total of 10 minutes in patient 1 (4 episodes), 7 min. in patient 2 (2 episodes), 10 min. in patient 3 (4 episodes), 18 min. in patient 4 (2 episodes), 22 min. in patient 5 (3 episodes).

The first episode of TC resulted in a significant decrease in extracellular glucose with a significant increase in extracellular lactate and pyruvate, with a rising of the lactate/pyruvate ratio.

In 3 patients there was a rise in extracellular glycerol. In 1 patient which had a rebleeding during induction extracellular glycerol increased significantly : this patient showed a local infarction, however without any symptoms.

Conclusions : Peroperative cerebral microdialysis is feasible and safe and enables almost on-line monitoring of the biochemical markers of brainischernia and brain cell damage. We think it can give us valuable information on the effects of temporary clipping and the possible duration of TC.
