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Patron: James T Rutka, MD PhD FRCSC FACS FAAP (Toronto)
Chairman of scientific program committee: George Jallo, MD (Baltimore)
Editor of the proceedings: G Narenthiran, BSc(MedSci) MB ChB MRCSE (Grt. Manchester)

1.
Treatment of spinal dural arteriovenous malformations: a single center experience.

Andres RH, Guzman R, Remonda L, Schroth G, Seiler RW, Barth A

Departments of Neurosurgery and Neuroradiology, University of Berne, Switzerland. E-mail: robert.andres@hispeed.ch,

Aim: Spinal dural arteriovenous malformation is the most common type of arteriovenous malformations (AVM) involving the spine, usually presenting with a slowly progressive myelopathy and/or radiculopathy. The management of these rare lesions either consists of catheter embolisation or surgical intradural interruption of the draining vessel. The decision between these techniques is often controversial. The present study assessed the outcome of patients with spinal AVMs that were treated with surgery, endovascular embolisation or a combined treatment strategy.

Method: Our series consisted of 12 patients with dural AVMs of the thoracic or lumbar spine that were treated in our institution between 1994 and 2004. Six patients were treated with embolisation alone. Three patients underwent laminectomy and surgical interruption of the AVM. Three patients were treated by endovascular techniques followed by surgery. Patients' age ranged from 20 to 76 years (mean 59 years). Functional outcome was assessed using the modified Aminoff-Logue grading scale with a mean follow-up of 6 months.

Results: The 3 patients who had undergone surgery had successful occlusion of the AVM and had marked clinical improvement. Of the 6 patients who had only endovascular treatment 4 of them had successful occlusion and clinical improvement; the other 2 patients required re-embolisation in a second session due to extensive fistulas. Two of the 3 patients with extensive lesions who were first treated endovascularly followed by surgery had good outcome.

Conclusion: We conclude that both surgical and endovasular treatment of spinal dural AVMs resulted in a good and lasting clinical outcome in the majority of cases. Embolisation should be attempted at the time of diagnostic angiography if the lesion is endovascularly accessible. An interdisciplinary approach is often necessary to address the technical complexity of this rare disorder.

2.
Web-accessible database for Neurosurgeons: the database of functional neurosurgery targets

Narenthiran G*, Slavin K†, Ganesalingam G§,

*Department of Neurosurgery, Hope Hospital, Salford, Manchester, UK; †Department of Neurosurgery, University of Illinois at Chicago, Chicago, USA; §Department of Medicine, King's College Hospital, London. E-mail: g_narenthiran@hotmail.com

Aim: The aim was to establish a database of functional neurosurgery targets used by different functional neurosurgeons on the World Wide Web (web).

Method: We created a database using 'FileMaker Pro 6 Unlimited' on a Desk-top computer running 'Windows XP Professional' operating system; 2 Ghz

Pentium 4 Processor; 512Mb RAM. The database contains 25 fields. We obtained a broadband Internet line with static IP address (81.137.249.16) from 'British Telecom'. We published the database on the World Wide Web with the help of the 'Web plug-in' provided with the FileMaker Pro 6 Unlimited.

Results: The database is accessible on the web at http:// 81.137.249.16. This database system was set-up without help from professional information technology (IT) personnel.

Conclusion: FileMaker Pro 6 Unlimited provides a means of setting up web-based databases, which could be utilised for multi-institutional data collection.

3.
Accelerometry during ablative thalamic surgery for Parkinsonian tremor.

Ciurea J*, Nestianu V†, Simoca I*
*Dept. of Neurosurgery, University Hospital " Bagdasar Arseni", Bucharest, Romania; †Dept. of Neurophysiology, University of Medicine Craiova, Romania. E-mail: ciureaj@yahoo.com

Aim: The aim was to assess tremor, using accelerometer in patients with Parkinson's disease during thalamotomy.

Method: We custom built an accelerometer. We used the accelerometer to assess tremor during surgery in 8 patients with Parkinson's disease. Using this accelerometer we measured the occurrence of tremor and its frequency and amplitude during microstimulation of target location. We also concurrently assessed tremor by direct observation. The optimal lesion site was taken to be where the tremor was suppressed with the lowest electrical stimulation.

Results: In our study group we had 8 patients: 3 women and 5 men, with an age range of 32 to 68 years and with a mean of 52 years. These results demonstrated an greater sensitivity of the accelerometer system (at lower stimulation thresholds) to changes in frequency and amplitude of tremor when compared to direct observation by a trained neurologist.

Conclusion: Intraoperative accelerometer monitoring during thalamotomy for tremor in patients with Parkinson's disease, provides an adjunct to improving sensitivity of assessment of target stimulation as well as documenting effects of lesioning.

4.
Relationship between cranial defect and physiology of cerebrospinal fluid - an experimental study in rabbits.

Erdogan E, Duz B, Karacalioglul O, Timurkaynak E. Departments of Neurosurgery and Nuclear Medicine1, Gulhane Military School of Medicine, GATA, Ankara-Turkey. E-mail: eerdogan@gata.edu.tr

Aim: The aim was to investigate the influence of cranial defect (from craniectomy) on the physiology of cerebrospinal fluid.

Method: Eleven rabbits were included in the study. The radio-pharmaceutical agent Tc99mDTPA (300 microcurie/0.1 cc) was injected into the IVth ventricle of each animal. The rate of clearance of it from cerebrospinal fluid was studied for each rabbit preoperatively and 24 hours, 7 days, 3 months postoperatively (large craniectomy), using gamma-camera. The Wilcoxon Signed Ranks test was employed to assess whether there was difference in clearance of Tc99mDTPA pre- and post-craniectomy.

Result: There was no statistical difference between the rate of clearance of the cisternal Tc99mDTPA in pre- and post-craniectomy rabbits.

Conclusion: These data suggest that the cerebrospinal fluid kinetics do not significantly change following large cranial defects.

5.
Rate of external ventricular drain malposition.

Narenthiran G, White BD. Department of Neurosurgery, Queen's Medical Centre, Nottingham, UK. E-mail: g_narenthiran@hotmail.com

Aim: The aim was to ascertain the rate of malposition of external ventricular drain (EVD) in our centre.

Method: In our department all external ventricular drains (EVD) are inserted in operating theatre (rather than in the intensive care unit). We checked the operation logbooks of our operating theatres for a 1-year period (14 February 2003 - 13 February 2004) to find out i. the number of EVDs that had been inserted and ii. the number patients who had insertion of more

than one EVD. Then we checked the notes and/or imaging studies of the patients who had reinsertion of EVDs to check for the reasons for this.

Results: Over that 1-year period 84 patients had insertion of EVDs (frontal, parietal and occipital) and 13 of them had more than one EVD; 8 of the 13 were for malposition of EVD (as ascertained from the notes or from computed tomography (CT) of head). Therefore there was a minimum of 9.5% complication from malposition of EVD with a minimum complication rate for insertion of EVD being 15.5%.

Conclusion: Strategies and protocols must be devised to eliminate malpositioning of EVDs. It might be worth using Ghajar's guide or intra-operative ultrasound guidance in inserting EVDs to minimise the risk of malposition.

6.

Combination of frameless navigation and intraoperative neurophysiology for motor cortex stimulation for brain central pain.

Slavin K MD, Thulborn K, Department of Neurosurgery, Univeristy of Illinois at Chicago, Chicago, IL, USA. E-mail: kslavin@uic.edu

Aim: Motor cortex stimulation is one of the few available options for management of brain central pain syndromes. Originally described only several decades ago for the treatment of thalamic and trigeminal pain syndromes, this non-destructive procedure is gradually gaining popularity among neurosurgeons and pain specialists. Recently, we began using a combination of computer-guided navigation and intraoperative electrophysiological monitoring for localization of the motor cortex in patients with medically intractable pain following a stroke or surgical intervention.

Clinical presentation: The patient had been experiencing pain on the side of his body or face contralateral to the infarction. The patients had not responded for medical management including a trial of intrathecal opioids.

Intervention: The motor cortex was initially identified using a functional MRI on 3-Tesla scanner; this information was then used during intraoperative computer-aided navigation with a frameless guidance system. In order to further verify location of the motor cortex, we used epidural recording of the somatosensory evoked potentials after a small craniotomy was made under general anesthesia. Reversal of the polarity of the N20 peak indicated the line separating the primary motor and sensory cortical areas. The quadripolar electrode(s) (Medtronic) was then positioned over the motor cortex. During the trial, the pain relief was obtained with bipolar stimulation below the threshold of motor stimulation. There were no stimulation-induced paresthesias. The pain relief from the stimulation was almost immediate and lasted for few minutes after the stimulation was stopped. After a week long trial the electrode(s) was internalized under the general anesthesia.

Results: Using a combination of functional MRI, image-guided computer navigation, and intraoperative electrophysiological testing, we were able to precisely localize the primary motor cortex and subsequently achieve excellent pain relief in the patient with medically intractable central brain pain.

Conclusion: A combination of functional MRI and frameless imaged-guided computer navigation can help in localising motor cortex for motor cortex stimulation for the treatment of central pain.

7.

Antibiotic-impregnated shunt catheters decrease the incidence of shunt infection in the treatment of hydrocephalus

Daniel M Sciubba MD, George I Jallo MD
Department of Neurological Surgery, Johns Hopkins University, Baltimore, USA. E-mail: E-mail: jgallo1@jhmi.edu

Aim: Most shunt infections occur within 6 months of shunt placement and chiefly result from perioperative colonization by skin flora. Antibiotic-impregnated shunt (AIS) systems have been designed to prevent such colonization. The aim of this study was to evaluate the incidence of shunt infection after introduction of an AIS system in a pediatric hydrocephalus population

METHODS: We retrospectively reviewed all pediatric patients undergoing CSF shunt insertion at our institution over a 3-year period. During 18 months prior to October 2002, CSF shunts included standard, non-impregnated shunt catheters. During the 18 months following October 2002, CSF shunts included antibiotic-impregnated shunt catheters. Patients were followed for 6 months after surgery, and all shunt-

related complications, including infection, were evaluated. The independent association of antibiotic-impregnated shunt catheter use with subsequent shunt infection was assessed via multivariate proportional hazards regression analysis.

RESULTS: 147 pediatric patients underwent 325 shunting procedures. 181 (56%) shunts were placed with non-impregnated catheters prior to October 2002. 144 (44%) shunts were placed with antibiotic-impregnated shunt catheters after October 2002. Sixteen (9%) patients with non-impregnated catheters experienced shunt infection, whereas only three (2%) patients with antibiotic-impregnated catheters experienced shunt infection within the 6-month follow-up period, $p = 0.025$. Antibiotic-impregnated shunt catheters, adjusting for inter-cohort differences via multivariate analysis, were independently associated with a 3.5-fold decreased likelihood of shunt infection.

CONCLUSION: The antibiotic-impregnated shunt catheter significantly reduced incidence of CSF shunt infection in children with hydrocephalus during the early postoperative period (less than 6 months). The AIS system used is an effective instrument to prevent perioperative colonization of CSF shunt components.

8.

Toxicity and efficacy study of locally-delivered chemotherapy in a novel rat model of intramedullary spinal cord tumors

Gustavo Pradilla MD, Gaurav Mavinkurve BS, Federico G. Legnani MD, Betty M. Tyle MD, Neha Gosalia BA, Jonathan Pindrik BS, Alia Hdeib BA, Carlos A. Bagley MD, Henry Brem, MD, George Jallo MD
Department of Neurological Surgery, Johns Hopkins University, Baltimore, USA. E-mail: gjallo1@jhmi.edu

Aim: Intramedullary spinal cord tumors (IMSCTs) are associated with significant morbidity/mortality and current treatment strategies for IMSCTs remain limited. Systemic chemotherapy has been unsuccessful for these tumors. Recent advances in local-drug-delivery systems make them ideal for IMSCTs. We report the toxicity of novel injectable chemotherapy-delivery systems OncoGel®(Taxol gel), Saber™ (Carboplatin gel), and Paclimer® (Taxol-microspheres) in rat spinal cord, and the efficacy of OncoGel-1.5% in an IMSCT model using 9L-gliosarcoma in rats.

Methods: Toxicity: Fischer-344 rats (n=21) were randomized into 7 groups (3 rats/group) to receive an intramedullary injection (IMI) of either ReGel(empty gel), OncoGel-1.5%, OncoGel-6%, Saber-15%, Paclimer-2mg/kg, Paclimer-20mg/kg, or DMEM(Dulbecco-modified-eagle-medium). Daily evaluation of hind limb motor function (using the BBB-Basso-Beattie-Bresnahan-scale) and weight gain were analyzed. Efficacy: Fischer-344 rats (n=12) were randomized into 3 groups (4/group), group 1 received an IMI of 9L cells, groups 2 and 3 received an IMI of 9L, plus Oncogel-1.5% or ReGel, respectively; animals were assessed daily using the BBB scale.

Results: Toxicity: Animals treated with Oncogel-6% showed acute toxicity (1 animal died on day 4, 3 animals were euthanized due to complete paraplegia on day 5), animals in other groups showed weight gain and maximal BBB scores throughout the experiment. Efficacy: Group 1 (controls) had median onset of paralysis (MOP) of 10 days, Group 2 (Oncogel-1.5%) had no significant motor deficit by day 20, Group 3 (ReGel) had MOP of 14±1.4 days.

Conclusions: Locally-delivered chemotherapy, with the exception of OncoGel-6%, was well tolerated by the animals. Oncogel-1.5% significantly prolonged onset of paralysis. Further studies are needed to determine the efficacy of SABER and Paclimer for IMSCTs.

9.

Intrathecal infusion of streptokinase for clot-lysis in neonatal subdural haematoma

Larionov SN, Sorokovikov VA, Novozilov VA
Department Neurosurgery of Scientific Center of Reconstructive and Restorative Surgery of Eastern-Siberian Scientific Center Siberian Branch of Russian Academy of Medical Sciences, Bortzov Revolutsii 1, Irkutsk, Russia. E-mail: snlar@mail.ru

OUTLINE: We report a case of a neonate treated for subdural hematoma by drainage and subdural streptokinase lavage.

CLINICAL PRESENTATION: A one month-old full-term baby presented with dyspnoea and seizures. CT of the brain found an extensive left pan-hemispheric subdural hematoma on the left **with thrombosis of**

the sigmoid and transverse venous sinuses.

INTERVENTION: She underwent urgent surgery – external drainage followed by lavage of the subdural space with streptokinase (25,000 units infused at 0.5 ml/h) for three days. After 72 hours of the lavage the external drain was removed and a subdural-subgaleal shunt were placed. The neuroimaging (CT and MRI) revealed a residual fluid collection in the left subdural space and recanalisation of the sigmoid and transverse sinuses.

CONCLUSION: In our experience a continuous streptokinase lavage of subdural space in a neonate with subdural haematoma, was not associated with any adverse events. Efficacy and safety of this method needs to be assessed in a larger, randomised and controlled study.