DO ENDOTHELIN-1 (ET-1) AND HUMAN BIG-ENDOTHELIN (b-ET) CAUSE SUBARACHNOID HAEMORRHAGE?

AHS Huneidi, C Thiemermann, PS Lidbury, EE Anggard, JR Vane, F Afshar.
St Bartholomew's Medical College, London

Endothelin-1 (ET-1) is a potent vasoconstrictor peptide found in various mammals including humans. Its precursor, big-endothelin (b-ET) can be activated by polymorphonuclear leukocytes. The authors reported that ET-1 and b-ET produced subarachnoid haemorrhage in the anaesthetised New Zealand white rabbit. Systemic administration of ET-1 (1 nmol/kg; n = 8) or b-ET (3 nmol/kg; n = 8) produced a substantial rise in the left ventricular systolic pressure (LVSP) and caused subarachnoid haemorrhage (SAH) in 75 (17%) and 87-5 (12%) of the experiments respectively (p < 0.05). The cyclo-oxygenase inhibitor indomethacin (5 mg/kg iv) potentiated the pressor effect of both peptides. Groups pretreated with indomethacin before ET-1 (n = 3) or b-ET (n = 3) developed SAH. Control animals treated with vehicle (saline; n = 7), the carboxy-terminal of b-ET (CT 22-38; 3 nmol/kg; n = 3), or indomethacin alone (n = 3) did not. A rise in blood pressure alone is unlikely to account for the SAH encountered with ET-1 and b-ET as angiotensin II (AII; 1 nmol/kg/min for 30 min; n = 8), produced a larger increment in LVSP but did not cause any SAH. Furthermore, there was no significant correlation between the rise in LVSP produced by ET-1 or b-ET and the severity of the haemorrhage.
An aneurysm group (n) | HLA antigen | Group f (%) | Control f (%) | p
---|---|---|---|---
All aneurysms (155) | DR1 | 12-9 | 20-8 | 0.016 NS
| DR7 | 32-9 | 24-2 | 0.022 NS
Anterior cerebral (57) | B8 | 14-0 | 27-1 | 0.019 NS
| B15 | 21-1 | 10-9 | 0.027 NS
| B35 | 21-1 | 11-5 | 0.038 NS
| DR1 | 10-5 | 20-8 | 0.041 NS
| DR7 | 10-1 | 20-8 | 0.043 NS
Middle cerebral (39) | B14 | 18-0 | 7-8 | 0.037 NS
| A3 | 14-9 | 28-2 | 0.040 NS
| B3 | 12-0 | 40 | 0.017 NS
| DR6 | 8-5 | 21-2 | 0.008 NS
| DR7 | 40-4 | 24-2 | 0.014 NS

*p = 504; *Fisher's exact test, 2 x 2 table, NS: not significant when adjusted for no. of tests.

The authors failed to demonstrate a link between possession of a specific HLA antigen and the presence of an intracranial aneurysm except for multiple aneurysms with a preponderance of Bw62.


SEVERE HEAD INJURIES IN BRITISH NEUROLOGICAL UNITS: INITIAL SEVERITY, MANAGEMENT AND OUTCOME
G Teasdale, L Murray, G Murray, B Jennett, JD Miller, MDMA Shaw, JD Pickard. Glasgow, Edinburgh, Liverpool and Southampon

Variations in methods of intensive care of head injuries reflect doubts about the effect on outcome of certain components of management. In a study of prognosis and outcome, data were collected prospectively on 988 patients admitted to one of four British neurosurgical units within three days of a severe head injury defined as resulting in coma (no eye opening, no comprehensible verbal response and not obeying commands).

Many of the features of the patients in the four centres were similar but interesting differences were found. There was a four fold variation in the annual incidence in different centres: from two to nine cases per 100 000 and a two fold variation in the proportion of intracranial to young falls (9% to 2%). These were variations in the speed of admission to neurosurgery, in patients’ ages and initial severities. There were also marked variations in the employment of different aspects of management (table 1).

<table>
<thead>
<tr>
<th>Centre</th>
<th>ICP Measured</th>
<th>Osmosis</th>
<th>Ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>33%</td>
<td>17%</td>
<td>51%</td>
</tr>
<tr>
<td>B</td>
<td>55%</td>
<td>53%</td>
<td>77%</td>
</tr>
<tr>
<td>C</td>
<td>1%</td>
<td>11%</td>
<td>68%</td>
</tr>
<tr>
<td>D</td>
<td>48%</td>
<td>34%</td>
<td>84%</td>
</tr>
</tbody>
</table>

The outcomes in the four centres are shown in table 2.

Table 2 Outcome at six months
<table>
<thead>
<tr>
<th>Centre</th>
<th>Dead</th>
<th>vegetative</th>
<th>Severe disability</th>
<th>Moderate/good</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>38%</td>
<td>17%</td>
<td>45%</td>
<td>45%</td>
</tr>
<tr>
<td>B</td>
<td>44%</td>
<td>10%</td>
<td>47%</td>
<td>45%</td>
</tr>
<tr>
<td>C</td>
<td>45%</td>
<td>30%</td>
<td>35%</td>
<td>45%</td>
</tr>
<tr>
<td>D</td>
<td>43%</td>
<td>23%</td>
<td>41%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Mortality in the centres with the more aggressive, interventionist approach was moderately reduced better in the prognosis cases.

The authors examined changes in FVamp and mean FV (8 MHz pulsed transcranial Doppler ultrasound, TCD), cortical CBF (H2-clearance) and cerebral perfusion pressure (CPP) during intracranial hypertension and systemic hypertension in normal rabbits and subarachnoid haemorrhage rabbits with impaired autoregulation. A two-slope relationship was observed between the FVamp and CPP with a breakpoint which coincided with the lower limit of CBF autoregulation of each animal. Below the breakpoint, FVamp varied directly with CPP and above the breakpoint FVamp varied inversely with CPP. The relationship between FVamp and CPP and the exhaustion of autoregulatory capacity were continuously monitored by computation of a floating correlation coefficient, RFVamp/CPP.

Simultaneous recording of FVamp, CPP and RFVamp/CPP may be a means of monitoring CBF autoregulation in clinical practice.

CONTINUOUS POST-OPERATIVE MONITORING OF CEREBRAL BLOOD FLOW USING THERMAL CLEARANCE, AS A PREDICTOR OF CORTICAL ISCHAEMIA
M Archbold, IR Chambers, AD Mendelow, HA Coolican, A Clark, A Green, DT Delpy. Newcastle and London

In subarachnoid haemorrhage, cerebral blood flow (CBF) may fall below critical levels. CBF measurement has been available for nearly 50 years, but established clinical indications for its use are few, perhaps because there is no widely accepted method for continuous CBF monitoring.

The thermal clearance of tissues is closely related to their blood flow. The authors have developed an implantable probe, enabling continuous monitoring of the thermal clearance of the cerebral cortical surface post-operatively, measured in mJ cm-1 s-1°C-1 (henceforward referred to as Clearance units). Zen flow studies recorded a value of 24–27 Clearance units. In 12 patients, all of whom had undergone clipping of anterior circulation aneurysms. In nine patients the thermal clearance stayed consistently high, and stable (45–54 Clearance units) all made uneventful recoveries.

In the three remaining patients consistently low post-operative thermal clearances (36–45 Clearance units) were noted. These clearances later fell to 32–35 Clearance units. Between one to 24 hours after these falls were noted, the patients developed clinical evidence of ischaemic complications.

Thus a group of patients had been identified at risk of ischaemic complications immediately after aneurysm surgery, when they were clinically stable. In each of these patients the clearance fell to lower levels prior to the development of ischaemia. The relationship between thermal clearance changes and established thresholds of cortical ischaemia require further investigation.


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Since January 1990, 37 patients had intracranial pressure monitoring carried out as part of their assessment for newly diagnosed craniofacial anomalies. Patients with hydrocephalus or who had undergone previous surgery were not included in this study. The method employed was the Camino intracranial pressure monitoring system. None of the patients monitored was 25 months with a range from two months to 11 years one month. The mean recording time was 20·9 hours. The procedure failed technically in four cases, all as a result of the bolts becoming dislodged, a technical failure rate of 10·8%. Complications occurred in two cases (5·4%) with no infection (1 seizure; 1 transient CSF leak after bolt removal).

Thirty-four traces of longer than six hours duration were available for analysis. In 11 cases the resting pressure was over 15 mmHg; in a further 14 cases the resting pressure was between 10–15 mmHg, while the rest was below 10 mmHg. The sleeping record was analysed and this showed that in the group that had a resting pressure between 10–15 mmHg, five patients experienced a sustained elevation of pressure above 15 mmHg. In only one patient who had a resting pressure below 10 mmHg was the pressure elevated above 10 mmHg during sleep.

The authors suggested that this technique was simple and safe to use and the information obtained valuable in the planning and timing of surgery.

### WHAT HAPPENS TO CAPSULAR REMNANTS FOLLOWING REMOVAL OF ACOUSTIC NEUROMA?

R J Ramsden, JE Gillespie, JE Dutton, Manchester

The fate of capsular fragments left attached to vital structures at the time of otherwise total resection of an acoustic neuroma is unknown. Knowledge of the long term outcome for patients in whom such tiny fragments have been left in situ at operation may have important implications for patient care. This is particularly relevant in those instances where an attempt is made to preserve hearing. Of 21 patients in whom a small fragment of acoustic neuroma remained after operation, 14 agreed to have enhanced MRI using gadolinium diethylene-triamine-pentaacetic acid (Gd-DTPA), a mean of 70 months (range six months–12 years) after surgery. Such imaging improves tumour detection.

At review none of the patients had developed new symptoms or signs and CT had failed to demonstrate tumour recurrence. After Gd-DTPA enhanced MRI, persisting tumour rests were identified in seven patients and in four of these the remnant appeared to have gradually enlarged. The tumour fragment seemed more likely to persist if it was not cauterised at the time of operation.

### PRESERVATION OF THE FACIAL NERVE DURING SURGERY FOR ACOUSTIC NEUROMA WITH CONTINUOUS ELECTROPHYSIOLOGICAL MONITORING

DA Jellinek, L Symon. London

Continuous EMG activity and responses to electrical stimulation of the facial nerve were monitored intraoperatively in 46 patients having primary removal of an acoustic neuroma. The rate of anatomical and functional preservation of the facial nerve of these patients was compared with a matched population where a facial nerve stimulator and monitoring of facial muscle contraction by the anaesthetist only was used. Overall 93% (n = 43) of facial nerves were preserved anatomically in patients with continuous EMG monitoring, compared with 64% (n = 90) of patients (n = 140) without continual monitoring. Among the 43 cases with anatomical facial nerve preservation, 65% (n = 28) had immediate functional preservation. Immediate functional preservation was only achieved in 40% (n = 36) of those anatomically preserved nerves (n = 90) where conventional monitoring was used.


The use of intra-operative facial EMG was examined to assess facial nerve integrity during surgery for cerebello-pontine (CPA) angle tumours. Eighteen patients were grouped according to size of tumour (0–2·5 cm–11 cases; over 2·5 cm–7 cases). The facial nerve was identified and integrity monitored throughout the operation by observing the EMG response to local bipolar electrical stimulation (35 Hz). Post-operative facial nerve function was graded according to the House Scale (follow up eight to 48 months). Tumour removal was complete in all cases. In patients with tumours up to 2·5 cm, intra-operative nerve stimulation elicited a good EMG response in eight of the 11 cases, all of which regained good facial nerve function after operation (House Grades I and II). In the remaining patients with small tumours, the EMG response was lost: two subsequently developed a moderately severe (Grade IV) dysfunction and the third a total paralysis (Grade VI). In the large tumour group, facial nerve stimulation indicated electrical integrity in three patients, two of whom developed moderate (Grade III) and the third, severe (Grade V) dysfunction. In the other four cases nerve function could not be detected at operation; three of these developed a moderate facial nerve dysfunction (Grade III/IV). Intra-operative facial nerve monitoring appeared to predict eventual facial outcome only in the small tumour group. The monitoring system proved simple to use during surgery and is now regarded as an important aid to surgery for CPA tumours.

### MICROSURGICAL EXCISION OF PONTOMEDULLARY CAVERNOUS HAMANGIOMAS A Jackowski, L Symon, D Bills. London

Although the natural history of cavernous haemangiomas (cavernomas) is incompletely understood, their tendency to present with spontaneous and repeated haemorrhages is well recognised. Brainstem cavernomas are fortunately rare. However, surgical treatment naturally carries considerable potential risk; the results of surgery have rarely been described. The authors reported their experience in treating seven patients with pontomedullary cavernomas that presented with one or more episodes of haemorrhage and followed for up to two years.

CT scans either demonstrated a haemorrhoma or focal region of high intensity within the brainstem. Angiography failed to reveal abnormal vessels to the cavernoma. MRI was most useful in diagnosis and in planning the surgical approach. An important observation was the finding of separate coexistent cerebellar medullary venous malformations (MVM) in two patients. Such an association needs to be recognised if haemorrhage or symptoms due to a cavernoma are not to be falsely attributed to an angiographically obvious MVM.

Evacuation of both haematomata and cavernoma was accomplished using standard microsurgical techniques, which was followed by significant improvement in neurological function in all patients.

### BENEIGN INTRINSIC TECTAL "TUMOURS" IN CHILDREN PL May, S Blaser, RP Humphreys, DC Harwood-Nash, HJ Hoffman. Toronto

A specific group of intrinsic dorsal midbrain "tumours" in six children were identified by CT and MRI. Each patient presented with the symptoms of raised intracranial pressure (ICP) as a result of hydrocephalus due to obstruction of the sylvian aqueduct. No patient had brain stem signs referable to the tectal tumour or subsequently. All patients underwent cerebrospinal fluid (CSF) diversionary procedures. The radiological features were consistent and specific with four patients showing tectal calcification and no contrast enhancement on CT. MRI in all patients showed a focal tectal tumour distorting the collicular plate with no cystic components and increased signal intensity on the T2W images. There had been no evidence of progression with patient follow up of 1·5, 2·5, 4·5, 5·5, 8, and 17 years. CSF diversion had been the only surgical treatment and no patient received deep x-ray therapy (DXT). Five patients had normal intellectual development. In contrast to the majority of previously described periaqueductal and tectal tumours, this group appears to be truly benign. The authors suggested that patients presenting with these clinical and radiological features may be managed by CSF diversion, serial examination and MRI scanning alone.

### COMPUTER GENERATED TITANIUM CRANIOLAPSTY—A PILOT STUDY PJ McDermott, JM Joffe, A Linney, A Mosse, M Harris. London

An outcome review of 40 cases of titanium cranioplasty fabricated from impressions taken of the patients' scalp showed that nine (23%) were ill-fitting and 12 (41%) of 9 frame plates had a poor cosmetic result. The unsatisfactory results were attributable to difficulty in defining defect borders, strain produced during insertion and inadequate communication between surgeon and prosthetist.

A pilot study of six cases fabricated from...
CT scan computer-generated models of cranial defects showed significant improvements. This method had the following advantages: patient-free procedure; well-defined defect margins and bone thickness to aid accurate plate design; improved aesthetic contour and orientation especially by mirror image reversal or superimposition of pre-operative scan; plate insertion was rapid because of accurate fit and, finally, potential for pre-operative osteotomy template and cranioplasty allowing one-stage procedure.

The procedure of scanning, imaging, mould production, plate design and insertion was described.

COLLAGEN VICRYL MEMBRANE AS A NEW DURAL SUBSTITUTE
RN Meddings, R Scott, R Bullock, DA French, TAH Hide. Glasgow

No ideal dural graft is currently available. Many materials have been evaluated and lyophilised cadaveric dura is currently being supplied. Recently, this material has been putatively associated with Creutzfeldt-Jacob disease.

The authors had evaluated a new collagen-coated Vicryl mesh (Lyodura) previously used in urological repairs. Its “handling characteristics” and suture strength are superior to other substitutes.

In this study three degradable dural substitutes were compared: 1) collagen vicryl (Bovine collagen coated vicryl mesh); 2) Zenoderm (Porcine dermis); and 3) Lyodura (Lyophilised human cadaveric dura). Using a ratcheted model the materials were implanted into 1.5 cm by 0.7 cm dural defects. In the control group the dura was excised but not replaced. Fifty five animals were used. They were killed at two, four, eight, 12 and 24 weeks after implantation, and the cranioptomy was re-opened. The four groups were evaluated in two ways: 1) adhesions between the cortex and dura were graded and photographed; 2) the histological and macroscopic characteristics of the new dura were assessed in decalcified H and E stained whole cranium sections.

Collagen vicryl produced few adhesions to the brain and the mesh was easily removed with no complications. Zenoderm and Lyodura remained undetected and produced more adhesions to cortex than collagen vicryl. Collagen vicryl supported ingrowth of fibroblasts and the production of a new collagen layer which resembled the original dura by three months. The two other dural substitutes were revitalised by host cells but remained undetected at three months with ingrowth of woven bone and persistence of inflammatory and foreign body response.

Collagen vicryl is a suitable dural substitute with potential advantages over the other materials, and should be more fully evaluated, both in laboratory studies and clinically.

NEUROSURGICAL OPERATIVE CODING: PROBLEMS AND PROGRESS
RJ Nelson, J Ganley. Bristol

Medical audit, resource management and contracting—all demanded by recent changes in the organisation of the NHS—require timely, accurate collection and coding of primary data. The retrospective coding of operative procedures from hospital records and discharge summaries of the national standard OPCS4 codes is slow, time-consuming and may result in significant errors. Clinicians can help overcome these problems by coding their own procedures post-operatively. Unfortunately, these efforts were hampered by the cumbersome structure and inconsistencies of the OPCS4 codes. The authors had studied ways of improving operative coding in a retrospective analysis of the annual workload of a regional neurological unit and its coded returns and by nationwide surveys of coding practices using structured questionnaires. Using these studies a computer operating code book which clarifies the present OPCS4 codes and prepares for future improvements in coding would be desirable.

READMISSIONS TO A REGIONAL NEUROSURGICAL UNIT. A QUALITY ASSURANCE MEASURE?
JD Palmer, PD Lees, JS Garfield, NG Dewar. Southampton

Quality assurance has become an essential part of neurosurgical practice. The Department of Health will increasingly apply a number of performance indicators in order to make comparisons between different units. Readmission rates may provide an outcome indicator allowing purchasers of care to make decisions on quality as well as cost. The readmission rates for the Wessex Neurological Centre were studied in the period January to December 1990. In that period 1928 patients were admitted with 324 of these being readmissions. The notes were examined on those patients readmitted and the admission classified into avoidable or unavoidable groups. Comparisons were made between consultants within broad diagnostic groups. One hundred and forty four readmissions (7.5% of total admissions) were classified as avoidable and 180 (9.3%) unavoidable. The diagnostic groups were discussed and comparisons made between the consultants practices. The results of this clinical audit were discussed as well as the validity of using readmission rates as an outcome indicator in neurosurgical practice.

EXPERIENCE WITH THE HITCHCOCK STEREOTACTIC FRAME IN A REGIONAL NEUROSURGICAL UNIT
N Kitchen, R Bradford. London

Unlike other commercially available stereotactic systems (for example, Leksell, BRW) there have been few reports, other than from the manufacturers, of the use of the Hitchcock frame. The authors reported their initial experience with the first 50 cases on whom the system was used following its purchase in October 1989. Fifty five procedures were carried out; 49 CT-directed burr hole biopsies and three CT-directed craniotomies. All were performed under GA by the same surgeon (RB), the mean anaesthetic time being 96 minutes. Complications occurred in two patients (one haematoma, one death from brain swelling). A positive diagnosis was made in 48 cases (96%) although in one a further biopsy was necessary. The superficial temporal artery and a one brain abscess were also successfully performed. The authors found the Hitchcock frame to be a simple, low profile system which allowed for quick and reliable burr hole procedures. It was also convenient for stereotactic craniotomies as it left the operative field relatively unencumbered. The frame was scanner dependent and thus calculations were easily done and the computer was not required. However, there had been technical problems with the biopsy needles and with the gantry fixation. In addition there had been some degradation of the hardware due to modern sterilising techni ques.

A MAGNETIC STEREOTACTIC SYSTEM
MA Howard, MS Grady, RC Ritter, G Gillies. London, Seattle and Virginia, USA

Current CT techniques provide a detailed three dimensional map of the brain that is suboptimally utilised by many standard neurosurgical treatment methods. To improve on current techniques and expand the potential role of neurosurgery, a magnetic stereotactic system (MSS) has been developed.13

The MSS enables non-invasive external manipulation of an intracerebral implant. Magnetic forces are exerted on the implant by an array of superconducting magnets. Radiographs define the implant position in relation to a preoperative MRI scan. A computer provides the surgeon with an image of the desired position of the brain, the location of the implant, and the option to move the implant in any direction desired.

Critical regions are avoided to preserve locations important for the brain. Potential clinical applications include: lesion making using a radiofrequency source to inductively heat the implant, and drug delivery to curvilinear structures such as the striatum.

Experiments in six anaesthetised dogs and four pigs have demonstrated that implants can be safely directed in three dimensions throughout the brain. Inductive heating of the implant creates well circumscribed lesions in the desired brain region. Human clinical studies using MSS delivered hyperthermia are currently under way in patients with gliomas, with the aim of destroying tumour cells that have been implanted within the confines of the tumour.


SHOULD THE NEUROSURGEON WEAR PROTECTIVE GLASSES?
K El-Shunnar. Edinburgh

The current debate among members of the medical profession has ruled out the possibility of obligatory HIV testing of all patients undergoing surgical procedures. With the impossible task of identifying all those high risk category patients,1 there is increasing concern among surgeons about contamination with patient's blood. With this in mind, the author, who does not normally wear glasses, conducted a pilot study where the need by the neurosurgeon to wear protective glasses in the operating theatre was evaluated.

Thirty consecutive neurosurgical procedures in which the author was involved in over a period of two months were looked at prospectively in relation to contamination of the surgeon's glasses at the end of the
procedure. The results of this small study showed that there was a 100% risk of contamination with blood and/or bone dust for the main surgeon performing the craniotomy and using a high speed drill. As an assistant the risk dropped to 50% for blood contamination and 20% for bone dust. Spinal surgery led to no contamination except where metal fixation was used and again this was attributed to the use of the high speed drill. Therefore it was recommended strongly that protective glasses should be used during craniotomy and whenever the high speed drill is used.


A LATERAL APPROACH FOR VENTRALLY PLACED TUMOURS OF THE CRANIOVERTEBRAL JUNCTION G Kراتينον, HA Crockard. London

Tumours in this location are rare, presenting considerable difficulties of access and surrounded by the spinal cord/medulla, cranial and cervical nerves and important vessels. Meningiomas and neurofibromas are the commonest intradural tumours with the majority of them placed anterolaterally. Posterior and posterolateral approaches offer poor exposure which need considerable retraction to improve. Anterolateral approaches present limitations while the transoral approach, although effective in pure midline lesions, can be restrictive for ventrolateral tumours or broad-based meningiomas.

Anatomical dissections identified a possible lateral route, effected with exposure and mobilisation of the vertebral artery and allowing satisfactory exposure of the ventral spinomedullary surface and adequate visualisation of intradural vascular and nervous structures. The bone removal included a laterally placed retromastoid suboccipital craniectomy removing the lateral rim of the foramen magnum, the posterior third of the occipital condyle and lateral atlanto axial mass and part of the posterior arch of atlas. Complete removal was achieved of four meningiomas and two neurofibromas from five female and three male adult patients (aged 24 to 70) and of one eosinophilic granuloma from a boy aged eight who, because of extensive bone destruction, required addition bone grafting and halo immobilisation. Another patient had previously undergone cervical laminectomy and a transoral attempt without success.

No deaths were recorded while complications included a case of transient facial nerve palsy due to per-operative carotid retraction and another of mild ipsilateral pyramidal weakness due to an ischaemic event. Both of them recovered rapidly. There were no cases of instability, CSF leak or infection. All patients improved with regression of power, sensation and pain relief.

Important advantages of the approach include: excellent exposure of the ventral spinomedullary surface, indirect early and with exposure of the vascular structures, preservation of stability, minimal risk for infection and CSF leak, elimination of need for retraction of the neuraxis and simplicity of instrument use. The results of this study are promising and show excellent combining total tumour removal with minimal morbidity.

THE MANAGEMENT OF OCCULT SPINAL DYSPHASIA: A REVIEW OF 49 PAEDIATRIC AND ADULT CASES KM Morris, GFG Findlay. Liverpool

In recent years prophylactic surgery for all patients with occult spinal dysraphism (OSD) has been advocated.1 Whilst this may be necessary for selected cases, the true incidence and natural history of OSD is unknown and therefore the ideal management for each individual patient is unclear and must be assessed individually.

The management of 22 children and 27 adults with occult spinal dysraphism (OSD) was reviewed. Patients were divided into three major groups: 1) childhood (CD), 2) secondary adult deterioration (SCAD)—a patient known to have dysraphism but to have been neurologically normal or stable for many years, and 3) primary adult deterioration (AD). A combination of compressive and tethering lesions were found more commonly in the adult group (AD). Surgery was mainly undertaken for rapid neurological deterioration or pain. Patients were otherwise carefully observed. Sensorimotor deficit (83%) and pain (78%) responded well to surgery. Urological function (20%) responded poorly.

Cerebral palsied children with lipomyelomingiocele may benefit from prophylactic surgery as may adults with mass lesions. Despite this the authors considered that there is still a case for conservative management in many cases.


ACUTE PARAPLEGIA AS AN EXTREME PRESENTATION OF ADULT TETHERED CORD SYNDROME IN A POST-MYELOMENIGOCELE PATIENT AG Filler, JA Britton, D Utley, HT Marsh. London

Thirty years ago, neurosurgeons began achieving substantial success in treating open myelomingocele, and the products of those successes are now presenting with unique adult problems which are late sequelae of the repairs. In a recent review of all published reports of adult onset tethered cord syndrome (TCS), 14 of 60 was a post-myelomingocele patient, although a second case has since been described.

The authors reported an additional 14 cases of adult tethered cord syndrome of which occurred in post-myelomingocele patients. In both of the post-myelomingocele cases, the neurological deficits were characterised by acute, severe, painful presenting symptoms of an obvious precipitating event. For example, a twenty two year old married, working mother, who had minimal gait deficit after perianal repair of a low lumbosacral myelomingocele. She was referred urgently from casualty, after suffering the sudden onset of complete paraplegia and near complete lower extremity sensory loss. CT myelography confirmed a taut tethering of cord and roots. She had only experienced modest improvement with dexamethasone. However, after laminectomy and release of tethered cord, she experienced rapid, dramatic recovery and walked out of the hospital without assistance one week after operation. Symptoms recurred eight months later but resolved with steroids alone.

ACUTE PARAPLEGIA AS AN EXTREME PRESENTATION OF ADULT TETHERED CORD SYNDROME IN A POST-MYELOMENIGOCELE PATIENT Panel discussion

Lively debate ensued with particular reference to pathophysiological mechanisms, different but uncertain natural histories of the various types, need for careful investigation including urodynamics and EMGs in the young patient, uncertainty about reoperation rates after prophylactic surgery, need for long term followup, postoperative imaging to audit correction of the anatomical problem and retethering.

A COMBINED SURGICAL APPROACH FOR RADICAL EXCISION OF SACROCOCCYGEAL TUMOURS. A REPORT OF FOUR RECENT CASES PO Byrne, IJ Robertson, RW Gullan, KM Anson, SA Andrews, AC Montgomery. London

Large sacrococcygeal tumours are rare and remain a difficult management problem. Chordomas are one of the common tumours encountered and may account for 10-20% of postero-sacral/sacral tumours. However, they only represent 3-4% of primary bone tumours, which themselves are rare. They tend to be locally destructive and have malignant potential, having a well documented ability to metastasise. Nevertheless, local recurrence tends to be the greatest management problem.

Four consecutive cases were presented who had been managed in the last two years, aged 21 to 40 years; three were chordomas and one a schwannoma. Each was managed by a combined general and neurosurgical approach. Major radical excision of the tumour was attempted in all patients, involving high amputation of the sacrum and lower sacral nerve root division, as appropriate.

The authors suggested that these large lesions could be radically excised with limited postoperative morbidity and excellent preservation of neurological function, including sphincter control, provided one S2 root was left intact. Future management should be directed toward early diagnosis with the hope of achieving 'cure'.

THE HALIFAX INTERLAMINAR CLAMP SYSTEM: UK EXPERIENCE P Sutham, M O'Sullivan, T Russell. Edinburg

The benefits and complications of the Halifax interlaminar clamp system had been evaluated by a retrospective patient review together with a postal questionnaire of nine other neurosurgical centres known to have an interest in spinal surgery. Of the eight centres which replied, four were excluded due to limited experience (three patients or less). In the remaining five centres, the Halifax system was used in four or more patients (minimum four, maximum 31). In 44 patients it was inserted at C1/2 and in one at C1/3. Clamp failure was recognised in 14 of these patients due to loose screws in ten and unhooking of clamps in four. Nine needed a second operation because of occipital pain and/or instability. Complications occurred between one day and nine months and represented 3-4% of the total (mean nine weeks). The indication for operation did not affect the frequency of clamp failure.
In the treatment of thoracolumbar fractures with incomplete neurological injury, management remains controversial. The authors concluded that the Halifax interlaminar clamps are useful in posterior fixation at C2 or below, although they report an increase in morbidity and pain, and recommend further study of the technique.

MANAGEMENT OF THORACOLUMBAR SPINAL TRAUMA WITH INCOMPLETE NEUROLOGICAL INJURY

ND Mendoza, R Bradford, J Lehovsky. London

The management of thoracolumbar fractures with incomplete neurological injury remains controversial. Adoption of a conservative approach with postural reduction and bracing may yield good results but may lead to a significant incidence of late post-traumatic painful spinal deformity. With the advent of one stage decompression and spinal fixation (using either anterior or posterior approaches) with intraoperative spinal cord monitoring it is possible to adopt a more aggressive policy to these injuries.

Nine patients (five male, four female with an age range of 16–46 years) had undergone spinal cord fixation and fusion. The spinal injuries consisted of four burst fractures of L1, two burst fractures of L3, one wedge fracture of T5, one wedge fracture of T12, and one burst fracture of L5. All patients had posterior short segment spinal fixation, with four patients having an additional anterior procedure, with intraoperative measurement of somatosensory evoked potentials. Five patients were in Frankel grade D pre-operatively and of these, four have improved one grade postoperatively. Four patients were in Frankel grade E both pre- and postoperatively. The average total hospital stay from injury to discharge was 22 days.

Short segment spinal fixation and decompression allows immediate mobilisation of the patient reducing both the duration of hospital stay and rehabilitation and the incidence of late neurological deterioration and post-traumatic kyphosis.


THE NEUROSURGICAL IMPLICATIONS OF INTRACTIBLE EPILEPSY

JB Miles, PL May, D Smith, DW Chadwick. Liverpool

Although surgery for epilepsy has been practiced for over one hundred years in the United Kingdom, there remains a large and increasing population of patients with intractable seizures who could potentially benefit from surgical intervention but who will never have access to this benefit. In 1989 there were approximately one hundred resective procedures for epilepsy carried out in the UK and estimates suggest a potential population of between two and ten thousand with a yearly incidence of hundreds. The selection of epilepsy surgery for seizures may be appropriate. The management of this increasingly important problem must involve the establishment of skilled teams of specialists from diverse specialties working in a single unit where the development and teaching of the speciality can be continued. The Liverpool experience and protocol for the complex pre-surgical evaluation of these patients was presented. Particular reference was made to the use of WADA testing and use of Foramen Ovale electrodes. The authors presented the surgical options currently available and those that may need to be incorporated in the future, for example, radiosurgery, as well as the assessment of outcome. Finally, the problems implicit in taking a complex series of investigations down into the paediatric population were discussed with the hope that earlier surgery will result in lower morbidity and more prolonged benefit.

SURGERY FOR TEMPORAL LOBE EPILEPSY: PERSPECTIVE FROM PEROPERATIVE CORTICOGRAPHY AND TAILORED RESECTIONS

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There is considerable variation in opinion on the most appropriate operative technique for the surgical treatment of temporal lobe epilepsy. Some surgeons advocate procedures that resect predominantly or exclusively the medial temporal lobe structures; other groups concentrate on lateral temporal resections. The authors reported a retrospective review of 48 cases of temporal lobe resection for intractable epilepsy in which the extent of the medial and lateral resections was determined by peroperative corticography. Follow-up was carried out five years after surgery: complete or near complete seizure control was obtained in 30 cases (63%). Pre-resection corticography revealed a spike focus that was predominantly medial temporal in 27 cases (59%), predominantly lateral temporal in six cases (13%) and anterior inferolateral in 12 cases (25%). Eighty out of nine patients (89%) without residual activity on post-resection corticography obtained a good surgical result as opposed to only 19 of 35 (54%) with residual activity suggesting this was of some predictive value. The extent of the medial and lateral resection has no effect on the surgical outcome suggesting that the procedures were correctly tailored with the corticography.

STEREOTACTIC SELECTIVE AMYGDALO HIPPOCACTOMY—AN ALTERNATIVE APPROACH

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Anterior temporal lobectomy is the most commonly employed method for the surgical treatment of drug-resistant epilepsy where a lateralised temporal focus has been identified. A standard temporal lobe resection in the dominant hemisphere is associated with unacceptable morbidity. In such cases, selective amygdalo-hippocampectomy has developed as an alternative approach. The trans-sylvian route for amygdalo-hippocampectomy may be associated with morbidity related to vascular complications in the middle cerebral artery distribution. A lateral transcerebral approach using the Kelly-Goerss-Kall stereotactic CT directed apparatus offers an alternative method of selective amygdalo-hippocampectomy which does not expose the sylvian vessels.

Open stereotactic resection of the amygdala and hippocampus in the dominant hemisphere using the Kelly-Goerss-Kall apparatus had been used on four patients (mean age 23, 2 males: 2 females). All four patients had a cessation of seizure activity and reduction in seizure frequency (2) with minimal morbidity (one transient dysphasia and one transient VIth nerve palsy).

LUMBAR MICRODISECTOMY: A LONG TERM REVIEW OF THE FIRST 100 CASES

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Despite the high success rate of lumbar disc surgery in the short term, recent studies have called into question the benefits of surgical treatment in the long term. 1 Lewis et al., showed a re-operation rate of 18% five to ten years after the initial discectomy.2 One hundred consecutive patients presenting with unilateral sciatica, with evidence of dural irritation and nerve root compression due to a radiologically proven lateral disc at a single level, were reviewed five to nine years after lumbar microdiscectomy. A number of outcome variables were assessed using either a patient questionnaire or direct contact. Nine patients had further surgery, and at operation seven of these were found to have further disc extrusions. Only one re-operation was performed more than six years after the initial surgery. Two further patients described symptoms suggestive of recurrence, but not sufficiently severe to consider further surgery, and 97% felt that surgery had been beneficial.

The results of this study would suggest that lumbar microdiscectomy not only provides short term symptomatic relief, but compares favourably with other techniques in terms of long term outcome.


SURGICAL TREATMENT OF BRACHIALgia

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Brachialgia has been known as a complaint associated with cervical spondylisis since Lord Brain’s monograph on this disease. Treatment of it has been the subject of controversy from groups who advocate either a posterior or anterior cervical approach to the lesion.

The authors presented a preliminary report of their series of 211 cases of brachialgia having their first operation. The operative procedures used included anterior decompression, posterior decompression by either laminectomy or foraminotomy.

The authors conclude on the basis of their early results that surgical treatment of brachialgia appears to offer a good chance of resolution of the symptoms and that a range of surgical procedures should be borne in mind when approaching the problem. Long term follow up of the complete cohort of patients was planned.

CT GUIDED LOCALISATION OF BRAIN TUMOURS

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Accurate localisation of intra-cranial lesions is an essential prerequisite of any cranial neurosurgical procedure. Stereotactic frames utilising CT scanners have become standard in most units. Whilst the method is accurate it is time consuming. The authors reported a simple procedure. The patient was scanned in a routine manner. The slice which demonstrated the lesion most clearly was selected.
The scanner table was then taken back to this slice and the position lights turned on. The position lights would be passing over the scalp at the tumour site. The surface of the scalp was then marked with a small aluminium disc which sealed the tops of the Urografin contrast medium. The patient was then re-scanned with a single slice at this level thus demonstrating the tumour and the marker on the same slice. The marker can then be adjusted to lie more directly over the tumour if required. Axial scans were usually sufficient but lesions near the vertex and in the occipital region were localised best by using coronal sections. This method was most suitable for superficially placed tumours but was also helpful for the planning of all supratentorial craniotomies. It required no special equipment and complements other tumour localising methods. Experience with 60 patients was discussed.