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PROBLEMS IN THE MANAGEMENT OF POSTERIOR CIRCULATION ANEURYSMS
RP Sengupta, Newcastle

Direct obliteration of aneurysms in the posterior circulation is much more difficult than those in the anterior circulation. Very few surgeons have been able to achieve surgical results as good as those of Drake or Yasargil. Although the author had obtained good results in anterior circulation aneurysms, the outcome in posterior circulation aneurysms was far from satisfactory. From painful experience with a small series the author had learned that the difficulty of successful outcome in these aneurysms was mainly a reflection of the lack of experience with these rather rare aneurysms, difficulty of exposure, manipulation of the vessels of the brainstem and difficulty of proximal control.

MANAGEMENT OF INTRACEREBRAL HAEMATOMAS: AUDIT OF CLINICAL PRACTICE 1988
PF Statham, NV Todd. Glasgow

The clinical management of all patients admitted with a diagnosis on computed tomography (CT) of intracerebral hematoma during 1988 was audited to establish if aetiology was important for management and outcome. One hundred and eighty four patients with supratentorial hematomas of 5 ml or more were identified from coded CT reports. Data were not available in two patients. Fifty seven were associated with subarachnoid haemorrhage (“aneurysmal”), 66 with trauma and 59 were “spontaneous”, presumed to be hypertensive or from an arteriovenous malformation (AVM).

Spontaneous haematomas were significantly larger and had a higher incidence of CT evidence of raised intracranial pressure (basal cistern effacement or midline shift); otherwise groups were similar. (see table).

Traumatic haematomas were evacuated more frequently and aneurysmal haematomas less frequently than the group as a whole ($\chi^2 = 17.8, p < 0.001$), whether deterioration occurred or not ($\chi^2 = 14.8, p < 0.001$).

Not only did patients who clinically deteriorated have a significantly worse outcome than those who were stable ($\chi^2 = 66.2$), but trauma patients who deteriorated had a better outcome, and aneurysm patients who deteriorated had a worse outcome than the group as a whole ($\chi^2 = 6.57, p < 0.05$). This was reflected in the rates of surgery for these two groups, conservative treatment in patients with deterioration relating to poor outcome.

TRAUMATIC INTRACEREBRAL HAEMATOMA: THE DETERMINANTS OF OUTCOME IN A SERIES OF 202 PATIENTS

Traumatic intracerebral haematomas (TICH) are diagnosed now more often in life with the widespread availability of CT scanning. Their clinical course is unpredictable, and the role of surgical evacuation in management is controversial. Data from the clinical and radiological records of 202 patients (151 male, 51 female) with TICH admitted to neurosurgical units in Britain were subjected to multivariate analysis.

One hundred and two patients were classed as good (Glasgow Outcome Scale 1-2) and 100 as bad (GOS 3-5). The Glasgow Coma Score (GCS) was a major determinant of outcome; a score on admission of 12 or greater gave a probability of 3:1 of a good outcome. This fell to 1:3 for a score of seven or less. Multiple haematomas, large size and central location each carried a poor prognosis irrespective of the GCS on admission. The best results following surgery were obtained in patients with a GCS greater than 12 when their haematoma was removed before deterioration. In patients who deteriorated, those who had surgery fared better than those who did not. Age and nature of trauma had no significant effect on outcome.

FAMILIAL SUBARACHNOID HAEMORRHAGE
IC Bailey. Belfast

Over the past 15 years the incidence of subarachnoid haemorrhage occurring in more than one member of the same family had been investigated. Nineteen families had been recognised in whom two or more members had had proven subarachnoid haemorrhage. In a further 17 instances a family history of subarachnoid haemorrhage was strongly suspected but not definitely proven because of the lack of confirmatory evidence by angiography, CT scan or autopsy.

Certain features of subarachnoid haemorrhage in these families was noted. Sibling subarachnoid haemorrhage often occurred at the same age and this was younger than the mean age of haemorrhage in the general population. The distribution of aneurysms was often identical and multiple aneurysms occurred more commonly than expected. If more than two members of a family had aneurysmal subarachnoid haemorrhage, there was an increased risk of other members of the family having asymptomatic aneurysms. Prophylactic scanning or angiography is recommended in such cases. These findings suggest that there is a genetic factor in the causation of subarachnoid haemorrhage in some instances.

EARLY SURGERY FOR RUPTURED ANEURYSMS: SHOULD WE CONTINUE?
AD Mendelow, RP Sengupta, P Geeta. Newcastle

While it is desirable to report management mortality for subarachnoid haemorrhage based on a complete Regional population rather than operative mortality, this is often impossible in units in the United Kingdom because of different referral patterns and inter-consultant referrals. However, most
surgeons are able to audit their own operative results, and this study reports the operative results with early surgery of two neurosurgeons who have tended to operate as soon after the ictus as possible. Two hundred and five patients had definitive aneurysm surgery within four days of their haemorrhage, while 696 were operated upon after five days. Overall, there was no difference in the outcome between the two groups (table 1).

### Table 1 Outcome

<table>
<thead>
<tr>
<th></th>
<th>Early</th>
<th>Late</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good recovery</td>
<td>71%</td>
<td>73%</td>
</tr>
<tr>
<td>Mortality disability</td>
<td>10%</td>
<td>17%</td>
</tr>
<tr>
<td>Severe disability</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td>Vesitative</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Death</td>
<td>8%</td>
<td>6%</td>
</tr>
<tr>
<td>Unknown</td>
<td>1%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Each of the two Neurosurgeons had a learning curve with early surgery: the mortality fell from 13% initially to 4% more recently. With late surgery no such learning curve was seen. The mortality was much higher in Grade III and Grade IV patients, both with early and late surgery. These results suggest that early surgery be practised safely in selected patients (Grade I and Grade II)—delaying surgery in these patients therefore exposes them unnecessarily to risk of further haemorrhage.

### WHAT IS OPTIMAL MANAGEMENT FOR PATIENTS OVER 60 YEARS WITH SUPRATENTORIAL GLIOMA? LESSONS FROM AN AUDIT

S Denholm, K El Shennar, IR Whittle, Edinburgh

The place of multidisciplinary intervention in elderly patients with gliomas is a controversial question. The proportion of elderly people in the UK is increasing. There is growing pressure for cost-effective medical management yet the natural history of glioma in this group is poor, and all treatment modalities are potentially hazardous. To address the questions of management and outcome an audit of patients aged over 60 years with gliomas treated at the Department of Clinical Neurosciences between 1982–89 was undertaken.

Eighty patients were reviewed. Surgical procedures included biopsy by craniotomy, biopsy by BRW stereotaxis, and tumour debulking using either formal or stereotactic microsurgical craniotomy. Tissue diagnoses were Gr III–IV glioma (63), Gr II glioma (5) with 12 patients having a CT diagnosis of malignant glioma. Treatment, median survival times (ST) and median length of hospital stay (not including radiotherapy) were:

#### EFFECT OF DEBULKING SURGERY ON SURVIVAL IN MALIGNANT ASTROCYTOMA

S Falci, DL Silberfeld, BA Bell, Atkinson Morley’s, London

Long term survival in patients with malignant astrocytomas has changed little over the past two decades. Surgery to debulk the tumour is widely practised, although it has not been shown to have a large effect per se on long term survival. Radiotherapy combined with partial tumour excision has been shown to prolong survival, with little additional benefit from chemotherapy. Stereotaxic biopsy has been shown to have a significant effect on survival in patients with deep-seated gliomas.

In this study, we have reviewed the results of surgery alone versus surgery plus radiotherapy in five elderly patients with glioma grades III/IV. The median survival for surgery alone was 14 months, and for surgery plus radiotherapy it was 18 months. These results indicate that surgical resection is worthwhile in elderly patients with malignant glioma.

### TREATMENT

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>%</th>
<th>ST (weeks)</th>
<th>Hospital (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steroids only</td>
<td>12</td>
<td>15</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Biopsy</td>
<td>24</td>
<td>30</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Debulking</td>
<td>12</td>
<td>16</td>
<td>15</td>
<td>21</td>
</tr>
<tr>
<td>Biopsy + radiotherapy</td>
<td>6</td>
<td>6</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Debulking + radiotherapy</td>
<td>26</td>
<td>32</td>
<td>32</td>
<td>25</td>
</tr>
</tbody>
</table>

### REFERENCES


### ANTI BODY TARGETED IRRADIATION FOR LEPTOMENINGEAL NEOPLASIA: CURRENT STATUS


Neoplastic meningitis is a devastating complication of malignant disease and is usually associated with survival of less than three months. A series of 18 grade III/IV patients who were treated in the Bristol United Hospitals by a single administration of intrathecal monoclonal antibody labelled with 30–60 mCi 131I. (Medulloblastoma 3, ependymoma 1, teratoma 1, primary tumour 2, glioma 1, B-lymphoma 1, melanoma 3, carcinoma 6). All patients were in relapse and did not receive adjuvant irradiation to evaluable disease within six weeks of immunonconjugate administration.

### IMMUNOCOSTEMED TUMOUR RESPONSE TO IN-VIVO BROMOEXYURIDINE

PL May, G Forster, D Spiller, T Cooke, RV Jeffreys. Liverpool

Although most pituitary tumours are regarded as benign, there is a significant rate of local recurrence and a few are frankly malignant. The prediction of clinically aggressive behaviour by histopathological means is inadequate and the selection of patients for pituitary radiotherapy is often empirical. The flow cytometric analysis of the DNA content of certain intracranial tumours has suggested that a high proliferative index may relate to a tendency to recur. The in-vivo administration of bromoexyuridine (BUDR) yields a reliable and accurate S-phase labelling index and evaluation by flow cytometry allows a much greater and therefore more representative number of cells to be examined. Previous authors have described the immunohistochemically derived S-phase fraction of pituitary tumours following the in-vivo administration of BUDR and have suggested a correlation between values of greater than 1% and aggressive behaviour. Others have used the monoclonal antibody Ki-67 to assess the growth fractions of pituitary adenomas and have shown that invasive tumours had a significantly higher value than non-invasive tumours. The authors reported their initial experience with the flow cytometric evaluation of the S-phase fraction in a group of pituitary tumours following the pre-operative administration of BUDR and discussed the correlation between high values of S-phase fraction and clinically aggressive behaviour.
MEASUREMENT OF CRANIOSPINAL COMPLIANCE: AN IMPROVED METHOD

IR Hughes, JD Miller, IR Whittle, A Lawson. Edinburgh

In an effort to find a more exact and less invasive way of measuring craniospinal compliance than traditionally calculated from the pressure response following a bolus injection into the CSF space (VPR), we have developed an automated method that uses an electronic square wave pulse generator to produce a small (0.001 ml) exact and reproducible transient volume increase in the CSF space (pulse duration = 100 msec). The amplitude of the ICP response (Pulse response) to this volume increment is time-averaged using a biological signal averager.

In an experimental model of intracranial hypertension in cats (n = 4), ICP was raised, through intraventricular infusion of mock CSF infusions from 10 mm Hg to 110 mm Hg. At each level of ICP, compliance was measured sequentially both by the VPR method and the new pulse response method. The VPR method always overestimated compliance compared to the pulse method (p < 0.001). The pulse response method showed less variance with a coefficient of variation (CV) ranging from 1.2% to 4.2% (mean CV = 3.6%) compared to a CV ranging from 3.2% to 21% (mean CV = 7.6%) with the VPR method.

This new technique appears to be a more sensitive and exact way of measuring intracranial compliance which offers the potential for noninvasive, continuous monitoring of deleterious changes in intracranial dynamics that could possibly lead to earlier or more effective management of conditions complicated by increased ICP.

NEW LAMPS FOR OLD

GA Flint. Birmingham

Stereotactically guided biopsy of small or deep seated lesions of the brain has now become a standard neurosurgical technique, facilitated by computerised tomographic localisation of the target areas. The better known and commercially available stereotactic frames have been modified so that they can be readily interfaced with scanning equipment. The cost of equipping a department with such apparatus is quite considerable and financial considerations may discourage a unit from developing this form of surgery. Alternatively, units may possess stereotactic equipment, designed originally for ablative procedures, which is not available commercially. This equipment could be modified for use with a CT scanner with relative ease and at little expense. The author described how the Hughes stereotactic apparatus had been modified and developed for this purpose.

STAB INJURY TO THE HEAD AND SPINE

N Rawlinson. Bristol

Nine cases of stab injury were presented who had been managed in the Department of Neurosurgery, Groote Schuur Hospital, Cape Town.

The incidence of stab injury is increasing in the non-white community. The majority are alcohol related. Injury to the brain or spinal cord may occur as part of a frenzied attack with multiple stab wounds, or as a premeditated single injury. Six of these injuries occurred to the head and three to the spine.

In the skull this type of penetrating injury is characterised by a trivial entry wound and deceptively mild clinical presentation. However, there is a delay in diagnosis and improvement from infective or vascular complications. In the spine the paraplegia may prove lethal. In the skull these injuries are managed by aggressive investigation and surgery (CT scans and angiography). Surgery is indicated for frontal sinus injury and dural tear, abscess, haematoma or vascular complication. Conversely, in the spine, the management of a stab injury is conservative, the emphasis being on rehabilitation.

OSSIFICATION OF CERVICAL POSTERIOR LONGITUDINAL LIGAMENT

TKY Lee, PB Chacha, J Khoo. Singapore

Personal experience of six cases of the posterior longitudinal ligament (OPLL) of the cervical spine, four of which required surgery, is presented. A prompt review of all the cervical spine radiographs in the authors' hospital. Out of 5,167 reports, 37 cases of OPLL were found forming the largest study of this disease outside Japan. OPLL was thought previously to be unique to the Japanese. The incidence of 0.75% was similar to that found in Japan but the disease seemed milder in Singapore. The male to female ratio was 3:1 and associations between OPLL, diabetes mellitus and ankyllosing spondylitis were discovered. Twelve patients had associated calcification of other cervical ligaments, particularly the anterior longitudinal spinal ligament. Hence a tendency to calcification may be important in the aetiology of OPLL. In this series, anterior spinal fusion with removal of the ossified ligament or multi-level laminoplasty gave satisfactory results.

THE VALUE OF MRI IN THE FOLLOW UP OF SPINAL INJURIES

P Sert, HA Crockard. Queen Square, London

In the follow up management of spinal injuries it is important to determine the extent of the cord injury and to detect the development of secondary complications such as syrinx and compression due to skeletal deformity. History and clinical examination may not necessarily alert the clinician until a late stage. Nineteen patients (12 males, seven females; age 19-44 years) with cord injuries had had an MR scan. Injuring mechanism included RTA, falls, epilepsy, bomb blast and penetrating injuries. The MR scan permitted an accurate assessment of the extent of injury: two patients had transsection and two had contusions of cord allowing definitive prognosis. Persisting cord compression was seen in five patients (four cervical, one thoraco-lumbar); all showed improvement in three. Syrinx and cord cysts were seen in six; three had surgery on more than one occasion, one had a single operation and in two the cysts did not expand and did not require surgery. Suspected pathology was noted in four patients—angiolipoma, hydromyelia, odontoid fracture and extra-dural meningioma.

The authors recommended that MRI should be a base line follow up investigation for all spinal cord injuries.

PRESSURE GRADIENTS IN IDIOPATHIC SYRINGOMYELIA—MANAGEMENT IMPLICATIONS

MD du Trevou, MR Bullock, JR von Dellen. Glasgow

In 15 patients with idiopathic syringomyelia pressures were simultaneously measured under various physiological conditions in the syrinx, spinal subarachnoid space and cisterna magna. At rest the pressures were equal and fluctuated with respiration but when the intra abdominal pressure, measured with a rectal catheter, was increased pressure differentials developed. Three types of syringomyelia were identified, each with its own management implications.

There were five patients in each category. Type I had two subgroups. In type 1A the syrinx pressure was higher than in the spinal subarachnoid space and in type 1B they were equal.

The authors suggested that patients with idiopathic syringomyelia are a diverse group and if the aim of the surgery is to normalise fluid dynamics then one-third of patients (type 1II) may not be surgical candidates. Types I and II require a procedure to relieve the obstruction between the cranial and spinal subarachnoid. In addition, type 1A would respond to a syringo-subarachnoid shunt and type II to a syrinx-peritoneal shunt. The patients continue to be followed up clinically, radiologically, and with repeat pressure measurements.

IDIOPATHIC COMMON PERONEAL NERVE PALSY

TJD Pigott, D Jefferson, DT Hope. Nottingham

Sixty six patients with foot drop presenting over an eight year period were retrospectively analysed. Previous studies had tended to concentrate on those cases of known aetiology. There were 13 idiopathic cases. The mode of onset was relatively acute, with an age range of 16 to 80 years (mean 49 years). Ten patients had partial lesions; the remaining three had complete lesions with no evidence of nerve function on nerve conduction studies.

Of the patients with incomplete lesions, eight had begun to recover within three months, one within 12 months and one within 14 months. Two of the three with complete lesions had surgery with no benefit at nine months.

In conclusion, incomplete idiopathic common peroneal nerve palsy can be expected to recover without intervention, but a complete lesion probably will not. Surgery is of doubtful benefit.

ADMISSION AND TRANSFER OF HEAD INJURIES
The Round Table Discussion was based on three short papers:
1. COMMUNICATION FAILURE IN HEAD INJURY MANAGEMENT.
G Quaghebeur, P Richards. Charing Cross, London

In 1984 a set of guidelines for the initial management of head injuries were published by a group of Neurosurgeons in the British Medical Journal. Despite the clarity of these guidelines inappropriate management and referral of head injuries still occurs in many Accident and Emergency Departments. In particular there seems to be a general failure to urgently refer patients with a reduced level of consciousness and a skull fracture.

A questionnaire was sent out to Orthopaedic and Surgical Registrars engaged in primary head injury management in two regions. The results indicated widespread ignorance of the existence of these guidelines, let alone knowledge of their contents. A review of popular undergraduate and postgraduate text books on surgery was undertaken and their advice on head injury management noted. Again the guidelines were rarely mentioned, particularly under-graduate text books. In some books the advice offered would be considered woefully outdated. It appears that the message on how to manage head injuries is not reaching those primarily involved in their care with the result that some patients are receiving inappropriate management.


2 PULSE OXIMETRY DURING INTER-HOSPITAL TRANSFER OF HEAD-INJURED PATIENTS
D Gentleman, R Patel. Glasgow

Pulse oximetry had been used to monitor the oxygenation of 25 head injured patients before and during ambulance transfer to a regional neurosurgical unit, using a Novametrix 505 pulse oximeter which both displays data and stores it for printing. All but two patients had an altered conscious level, nine (36%) were in coma, four (16%) were multiply injured, and six (24%) underwent intracerebral surgery after transfer. Technically satisfactory recordings of oxygen saturation lasting for 30-98 minutes were obtained in 23 patients (92%), six (27%) of whom had episodes of oxygen desaturation. The recordings were unsatisfactory in the other two patients because of extreme restlessness and repeated disconnection of the probe. No patient deteriorated neurologically en route and none arrived hypoxic at the neurosurgical unit.

It proved feasible and straightforward to monitor arterial oxygen saturation continuously during the resuscitation and transfer of acutely head injured patients. Further studies with more patients are needed to assess whether this will affect the frequency or severity of early hypoxia after head injury.

3 EXTRADURAL HAEMATOMA IN THE IRISH REPUBLIC—AN ANALYSIS OF 88 CASES WITH EMPHASIS ON DELAY
MCI O'Sullivan, W Gray, TF Buckley. Cork

Delayed surgery adversely affects the outcome of extradural haematoma. Only two neurosurgical units exist in the Irish Republic and with a poor road network, delay is inevitable. Eighty two cases had been audited. Fifty two (63.4%) cases exhibited a lucid interval and the table details the duration of transfer and the associated deterioration in level of consciousness 46 patients.

Eight patients had no loss of consciousness, six had an initial loss of consciousness with a sustained recovery and 16 were never lucid. The outcomes included 66 (80.5%) good; four (4.9%) moderately disabled; two (2.4%) severely disabled; four (4.9%) vegetative state and six (7.3%) dead.

The authors concluded that the delay in recognition and transfer was excessive which resulted in a high percentage of patients undergoing surgery in coma. Despite this, the results were favourable.1


TRIPHENYL TETRAZIOLIUM CHLORIDE (TTC) AS A MARKER OF ISCHAEMIC CHANGES IN RAT BRAIN AFTER MCA OCCLUSION

Permanent middle cerebral artery occlusion (MCAO) in the rat is now widely used as a model of focal ischaemia for the assessment of neuroprotective agents. The usual end point involves volumetric analysis of the infarct with histopathology but this is expensive and time consuming. Using the mitochondrial redox stain TTC is cheaper and quicker, but it has limitations. The volume of ischaemic damage in rat cortex delineated by TTC was compared to the volume defined by histopathology at four hours and 24 hours after MCAO. Animals treated with the NMDA antagonist MK-801 (3 mg/kg ip 30 minutes post occlusion) were compared to controls. The volume of cortical damage expressed as mm³ (SEM) was:

<table>
<thead>
<tr>
<th>Source of referral</th>
<th>Glasgow Coma Score on arrival</th>
<th>Duration of transfer (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>(3-4)</td>
</tr>
<tr>
<td>In hospital</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>Inter hospital</td>
<td>23</td>
<td>6</td>
</tr>
<tr>
<td>Direct</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

In a further study a comparison was made of TTC staining by immersion or by perfusion techniques at 5-20 minutes, 3-4 hours and 24 hours after MCAO. In this case the lesion size was assessed by measuring the area of damage in single sections at the level of the anterior commissure. The results are expressed as mm³ (SEM): MK-801 is a good neuroprotective agent in this model. TTC is an excellent marker of ischaemic damage at 24 hours but is unreliable as a marker of tissue damage in acute studies.

COMPETITIVE NMDA ANTAGONISTS: A VALUABLE TREATMENT FOR PREVENTING ISCHAEMIC NEURONAL DEATH?
R Bullock, J McCallon, GM Teasdale, DI Graham, FM Ingilis. Glasgow

Excessive release of excitatory neurotransmitter substances such as glutamate, aspartate, and acetylcholine damages neurones by causing prolonged depolarisation with massive influx of calcium and sodium ions, and efflux of potassium. This “excitotoxic” mechanism has been shown to cause neuronal damage in models of epilepsy, ischaemia, and probably fluid percussion injury. Excitotoxicity is mediated largely via glutamatergic post-synaptic receptor sites, the most important of which are glutamatergic synapses.

Non competitive NMDA antagonists (e.g. MK801) have been studied extensively in models of focal cerebral ischaemia, and have been shown to reduce infarct size dramatically (by 50%), not only with pre-treatment but more importantly by post-treatment up to two hours after occlusion. Unfortunately, non-competitive antagonists derange cerebral metabolism and cause death in some animals, so that their clinical value is in doubt.

Recently a new competitive glutamatergic NMDA antagonist (5212-494) has been synthesised and we have studied its effects in the cat middle cerebral artery occlusion model.
S212–494 was given 15 minutes prior to transorbital MCA occlusion in six anaesthetised cats. After six hours, perfusion fixation was performed. Infarct volume was quantitatively measured by mapping the area of infarction in serial brain sections and taken at the same anatomic planes and compared to infarcts in six control animals. S212–494 achieved a 65% reduction in total infarct size (76%, reduction in cortex) when compared to controls. This magnitude of protection is slightly greater than that achieved in this model with non-competitive antagonists, and double that achieved by Nimodipine. S212–494 is a potent anti-ischaeamic agent. Competitive NMDA antagonists may have less detrimental effects on the limbic system than non-competitive agents and therefore provide a powerful, clinically useful treatment for acute cerebral ischaemia.


The effect of hyponatraemia on the vasomotor responses of the cerebral circulation before and after experimental subarachnoid haemorrhage

RJ Nelson, S Perry, ACR Burns, J Roberts, JD Pickard. Southampton

Hyponatraemia is a frequent complication of intracranial disease and can in itself be responsible for neurological deterioration. It is associated with an increased incidence of cerebral infarction following subarachnoid haemorrhage (SAH).1 Impairment of cerebrovascular reactivity and cerebral autoregulation play an important role in the development of delayed cerebral ischaemia after SAH. However, very little is known of the effects of hyponatraemia on the vasomotor responses of the cerebral circulation either before or after SAH.

We have studied cerebrovascular reactivity to hypercapnia and cerebral autoregulation to trimetaphan-induced hypotension in normal and hyponatraemic rabbits of both sexes before and six days after SAH. SAH animals received two intracisternal injections of 0.5 ml/kg dextrane 60% 3 days and 7 days before SAH. Hyponatraemia (mean plasma Na+ 119 mmols/l) was induced over 48 hours by s/c injection of DDAVP and intra-peritoneal infusion of 5% dextrose on days 3 and 5. Sham animals received normal saline.

The cerebrovascular reactivity (%) change in cortical CBF measured by hydrogen clearance/mm Hg increase in PaCO2 of hyponatraemic (48 ± 4%) and SAH (13 ± 8%) was significantly less (p < 0.05, by analysis of variance) than control (11.6 ± 2.1) and sham (8 ± 1%) animals. The reactivity of hyponatraemic–SAH animals was preserved (9.2 ± 2.7).

During trimetaphan-induced hypotension the mean CBF of control and sham animals did not change significantly until MABP had fallen to 30 and 40 mm Hg respectively. The cerebrovascular reactivity of the hyponatraemic, SAH and hyponatraemic–SAH animals, was significantly impaired. The pathophysiological consequences of these findings were discussed.


This work was supported by the Wellcome Trust.

VASOCONSTRICTOR RESPONSES TO ENDOTHELIN IN CAT PIAL VEINS IN SITU

M Robinson, TL Grant, J McCulloch. Glasgow

Endothelin is a 21 amino acid peptide first demonstrated to be released from cultured aortic endothelial cells by Yanagisawa et al.1 Endothelin has previously been shown to have potent and prolonged vasoconstrictor activity in various in vivo and in vitro systems. The authors used a cat pial window preparation2 to apply endothelin (3 x 10^-4 M to 3 x 10^-4 M) directly to individual pial arterioles and veins and demonstrated strong dose-dependent vasoconstrictor responses in both pial arterioles (max = 33.6 ± 38.6%; n = 6-9) and pial veins (max 35.1% ± 27.8%; n = 6-9). On a molar basis endothelin is the most potent vasoconstrictor agents yet described. Arterioles remain significantly constricted (p < 0.05; n = 5-9) compared to controls for 90 minutes following a single microapplication of endothelin. This is far in excess of the duration of vasoconstriction seen with any other agent in this preparation.

Nevertheless, exposure of arterioles preconstricted by endothelin (3 x 10^-4 M to K+ 10 mM in CSF and alkalotic HHCO3^-22 mM) resulted in vasoconstriction (+ 63.0% ± 11.8%) and vasodilatation (- 22.7% ± 6.1%) respectively followed by return to their endothelin constricted caliber.

The authors considered it paradoxical that such potent and prolonged cerebral vasocsonstriction, to levels consistent with impairing local cerebral blood flow, is nevertheless still so responsive to changes in the local ionic environment, putatively the endogenous mechanism of cerebral microvascular regulation.


ISCHEMIA MENTAL DETERIORATION REVERSIBLE AFTER CEREBRAL REVASCULARISATION: CORRELATION OF SINGLE-PHOTON EMISIONSPECTRUM WITH NEUROPSYCHOLOGICAL STUDY IN FIVE PATIENTS

JM Derlon, F Viader, JM Derlon, F Viader, G Bouvard, MC Petit, M Thomas-Lamotte, JP Houtteville, M Dress, B Dupuy. Caen, France

Five patients were referred for multiple obstructive lesions of the supraarteries, and progressive mental impairment over the six months before admission. Only one patient had a fixed (and moderate) focal deficit, two patients presented with TIA’s, and the last two had focal neurological events in the right hemisphere. The C1 scan was within the normal range or disclosed only small hypodense ischaemic areas which could not explain the mental disorders. Hemodynamic assessments included a CBF study with external counting (Novo-Cerebrograph R) of the inhaled 133Xe before and after IV acecolazolamide, and a SPECT measurement of the CBF (after transfusion of autologous 90mm Tc-labelled erythrocytes). In all five patients a severe haemodynamic reserve impairment was found, with low resting CBF which did not significantly increase on either side after IV acecolazolamide. A revascularisation procedure was performed in all patients (ECIC by-pass in three, ICA endarterectomy in two). In all five patients there was very obvious improvement of both the hemodynamic parameters (resting CBF and response to IV acecolazolamide) and neurological tests. Hence, some cases of ischaemic mental deterioration may be the consequence of chronic cerebral hypoperfusion and might benefit from surgery. The criteria used to identify such patients were: mental impairment of recent onset (less than six months) with or without a minor or improving focal neurological deficit; a CT scan that is normal or shows only a minor carotid or vertebral obstructive lesions on angiography; symmetrical CBF and severely reduced rCBF with no increase in rCBF following IV acecolazolamide.

RADILOGICAL ASSESSMENT OF ASYMMETRY IN THE VERTEBRO-BASILAR CIRCULATION IN RELATION TO THE ETIOLOGY OF TRIGEMINAL NEURALGIA

R Illingworth, P Richards, R Sil. Charing Cross, London

Does asymmetry in the configuration of the superior cerebellar artery (SCA) explain the right-sided and female predominance in trigeminal neuralgia?

Vertebral angiograms in 376 patients, 206 females and 170 males, were measured in the lateral, and AP or Townes projections in relation to the skull. Loops were assessed for depth and asymmetry, and in relation to sex, age and arterial hypertension. The angiograms had been performed in 82.7%; studies for hydrocephalus, mass lesions, vertebral-basilar aneurysms and trigeminal neuralgia were excluded.

1 Depth of SCA loops: overall the mean depth was 12.07 mm in males and 11.36 mm in females (ns). The left SCA looped lower in the AP view in males than in females (P = 0.035).
2 Asymmetry: the SCA looped lower more often on the right side in females aged 50 to 80 (P = 0.04). Asymmetry in the curve of the basilar artery and in the dominance of the vertebral arteries was commoner in women (P = 0.01). Deepest SCA loops were the most asymmetrical (P = 0.0001).
3 Age: in the whole group and in females the depth of the SCA loop increased with age. (P = 0.0001).
4 Hypertension: the depth of the SCA loops in males and females increased with hypertension. (P = 0.005).

In conclusion, tortuosity in the vertebral-basilar system increases with age and hypertension but the SCA does not loop lower in females than in males. Asymmetry in the vertebral-basilar arteries is commoner in females and in older women the right SCA loops lower more often than the left.

REVERSE TENTORIAL HERNIATION: "UPCOMING"

NV Hadley, DM Hadley, D Doyle, JD Miller. Glasgow

The authors review 11 cases of postmortem confirmed "Upcoming" extracted from the neuro-patology records of five neuro-surgical units in six English hospitals from 1967–1988.

Glasgow

Upcoming was defined as upward displacement of the vermis with brainstem compression. It presented clinically with abrupt coma
FIBRIN GLUE FACIAL NERVE GRAFTING AT THE TIME OF AUSTRO-NEUROLOGY SURGERY AR Walsh, S Falci, NF Weir, M Schwartz, BA Bell, D Uttley. Atkinson Morley's Hospital, London

Permanent loss of facial nerve function is a significant cause of morbidity following successful surgery to remove a large acoustic neuroma. No patient operated on in the last two years, the facial nerve was left anatomically intact in 13 (58%). In two the facial nerve was divided and anastomosed end to end with Tisseel, and in 11 a sural graft was anastomosed between the cut ends with Tisseel.

Follow up comprised regular clinical assessment and facial EMG's. One patient with a sural graft died two weeks post-operatively, leaving 10 patients with follow up of three to 18 months (mean 10 months). Earliest recovery occurred at nine months with paresthesia of resting tone and eye closure. Voluntary facial movement recovered between 12 and 18 months. Three of the four patients whose follow up exceeded 12 months had voluntary facial movement, and five of six patients followed for nine months or more had recovered facial tone.

The authors found this technique simple to perform at the end of the operative removal of an acoustic neuroma, and the recovery of facial nerve function at 12 months was encouraging.

DO BRADYKININ AND ARACHIDONIC ACID CONTRIBUTE TO THE PATHOPHYSIOLOGY OF PERITUMORAL BRAIN ODEMA? IR Whittle, JD Miller. Edinburgh

Peritumoral brain oedema arises mainly from neoplastic endothelium. It has been proposed that "secondary mediators" released by tumours contribute to the pathophysiology of this oedema1 and that steroids inhibit these adverse effects. To investigate the possible roles of bradikynin and arachidonic acid the infusion model of brain oedema was used.

Bradikynin (5 and 150 µg/ml) and arachidonic acid (2-15 mg/ml) were slowly infused into the right forebrain white matter of the cat (n = 15) and multiple neurophysiological parameters monitored. Both infusions caused focal brain oedema (mean 11 g H2O/100 g tissue), focal disruption of the BBB to Evans Blue, perivascular leucocytic infiltrates, moderate oedema (mean 12 mm Hg), and a fall (mean 70%) in lumped cerebral blood flow. There was no alteration at nor-mocapnia in regional CBF or change in somatosensory or motor evoked potentials. These results confirm that bradikynin and arachidonic acid can potentiate peritumoral brain oedema formation and are chemotactic for neutrophils. However, in view of the lack of vasomodulation or electrophysiological changes it is unlikely that they contribute significantly to the pathophysiology of peritumoral brain dysfunction. The disparities between these and previous in vitro findings on the vas- and neuromodulatory effects of bradikynin and eicosanoids was discussed.

REFERENCES


INFLUENCE OF HYPOXIA ON FLOW AND INFUSION THRESHOLDS FOR SOMATOSENSORY EVOKED POTENTIALS P Eldridge, DT Hope, PM Yeoman, I Farquhar, M Mitchell, S Clarke, NJ Smith. Nottingham

Somatosensory evoked potentials (SSEP) depend for their integrity on a minimum cerebral blood flow (CBF) and therefore a minimum cerebral perfusion pressure (CPP) together with adequate oxygenation. Since the CBF required to maintain cellular integrity is close to that required to maintain electrical function, the behaviour of somatosensory evoked potentials in an experimental situation should predict the clinical situations in which the brain would be at greatest risk.

A model of intracranial hypertension was made in the cat by infusing saline into the lumbar sac. A uniform rise in intracranial pressure was obtained, and the pressure increased until SSEP were lost. CBF was measured by hydrogen clearance and CBF reduced. SSEP were abolished at a CBF of 10.ml/100 g/min in a normally oxygenated animal.

A second group of animals were made mildly hypoxic with 0.2 to 9 kPa. In this group SSEP were abolished at CPP of 20 mm Hg and a CBF of 15ml/100 g/min. The difference between the groups is significant p < 0.05. The quantitative difference is consistent with that predicted from the difference in oxygen carriage in the blood between groups.

Hence thresholds were significantly elevated with mild hypoxia. Although SSEP was lost at too low a value of CBF or CPP to be directly useful in clinical monitoring, these thresholds were raised such that even mild degrees of hypoxia are clinically relevant.
THE ELECTROMOTIVE POTENTIALS OF
ANEURYSM CLIPS
PV Marks, MH Christie, RH Hatfield, A Waters. Cambridge

The production of electrical currents by the
introduction of metals in electrolyte solutions,
as well as their effects upon living tissue, has
been known since the time of Volta and
Galvani.

Dental surgeons have known for many
years that if metallic prosthetic or restorative
materials of dissimilar composition are used,
electrical currents are generated within the
buccal cavity.

Several observations prompted the
Authors to study the electromotive potentials
of aneurysm clips in vivo and in vivo so as to
establish the magnitude of the potential
produced, the factors influencing such poten-
tials and the possible effects on vascular
smooth muscle.

It was found that an instantaneous voltage
as high as 250 millivolts was produced on
application of the clips to the rat common
carotid artery and this decreased to between
50 and 80 millivolts after 120 seconds. With
some clips, potentials of this order were
maintained for four hours or longer.

As such voltages are of physiological mag-
nitude, their effect on the resting potential of
vascular smooth muscle was examined and
found to be significant.

As the aetiology of post-operative vaso-
spasm is undoubtedly multifactorial, any
reduction in potential contributory factors
is likely to be beneficial. Hence the authors
proposed that clips which produce the
smallest EMF should be chosen, and where
possible multiple clips should be avoided. If
this is not possible, the clips should be of
similar type and composition. A lively discus-
sion ensued.

NEUROSURGICAL AUDIT

The Round Table Discussion included three
short papers and a wide ranging examination
of the principles and mechanisms of audit.

The problems of information technology and
outcome assessment were addressed in the
short papers but consideration also had to be
given to agreement for peer review, the
setting of standards for each indicator and
comparison of current practice with such
standards. The cycle of audit would only be
completed when change was implemented as
required and the effect of such changes
defined by remeasurement. Such audit was
labour intensive and audit assistants would
have to be provided. Problems of confiden-
tiality were discussed and it became clear that
all records are becoming part of the discovery
process by solicitors and that there is no time
limitation on such a discovery. Supra-regional
comparisons were required. Contracts to
provide a service must define in detail the
spectrum of severity of the cases to be treated
together with the quality of care and costs of
confirming such quality including post-
mortem examination. Such mechanisms
should not be restricted to the National
Health Service but must include any health
care system bidding for such contracts.

1 EXPERIENCE WITH THE ICS NEUROSURGICAL
AUDIT SYSTEM
G Brocklehurst, Hull

The tradition of good documentation has
been maintained in neurosurgery in order to
facilitate both continuity of patient care, and
research. The Neurosurgical Audit System
developed by Intelligent Computer Services
was installed by the beginning of 1989.

Alterations in computer capacity and pro-
cessing were required to achieve efficient
performance of the system. The Patients
Entry Form provided by the software proved
more than adequate for administrative and
clinical purposes, but the Audit Entry Form
required alteration of some fields and exten-
sive editing of the attached file for diagnostic
coding before it was clinically useful.

The Reports already incorporated in the
system were more suited to research for
administrative purposes such as audit and
resource management than for academic use.
A further Report Form had to be constructed
to provide a printed Inpatient Summary
needed for continuity of patient care. It was
necessary for Clinicians to sit alongside the
secretary for the production of such
summaries.

The ICS Neurosurgical Audit System can
be used to provide good neurosurgical
documentation but could be improved fur-
ther. Outpatients were not yet included in the
system.

2 EVALUATION OF A ONE YEAR MORTALITY
AND MORBIDITY NEUROSURGICAL UNIT AUDIT
R Garlick, RS Maurice-Williams, N Olsen.
Royal Free, London

The authors reported the outcome of the first
year of an audit system as applied to surgical
operations carried out in a regional neuro-
surgical unit.

Six hundred and forty six operations were
performed from 1 July 1988 to 31 June 1989.
The operating surgeon completed a question-
naire containing 21 items of information and
this was ratified by a weekly meeting of an
audit committee. Data relating to the follow-
ing was obtained: patient age, diagnosis,
intercurrent illness, type of operation, sur-
geon involved, operative problems (13·1%),
post-operative complications (surgical site
(18·1%), other (8·5%)), outcome and number
of days from operation to discharge. The
association between the occurrence of oper-
ative problems and complications at the
surgical site did not achieve statistical signif-
nance (p = 0·06). The authors emphasised
that one individual should be responsible for
organisation of such meetings with collation
of the information and that the weekly
reviews must be formalised. Precise defini-
tions and coding were required though the
difficulties of ascribing complications to the
disease itself or defects in surgical technique
were highlighted. The educational value of
audit was stressed.

3 KEEPING THE SCORE: NEUROSURGICAL
AUDIT OF CLINICAL OUTCOME
CHA Meyer, ER Hitchcock. Birmingham

A method was presented for describing the
clinical outcome of management suitable for
the audit of a wide range of conditions met in
neurosurgical practice. Clinical outcome was
described by a profile of ratings including
changes in disability (the Karnovsky scale),
change in presenting symptoms, operative
effect on the underlying pathological
progress, and clinical deterioration. Based on
a 10 year experience with this aspect of
clinical audit the method was illustrated by
reference to groups of patients treated for
ruptured cerebral aneurysms, brain glioma,
trigeminal neuralgia and carpal tunnel syn-
drome.

The data for such audit was quick and easy
to obtain and record—facilitating electronic
storage, retrieval and analysis.

The Rowbotham Memorial Lecture was de-
ivered by Professor DP Becker, UCLA
School of Medicine, United States, on The
Scientific Basis for the Management of Brain
Trauma.