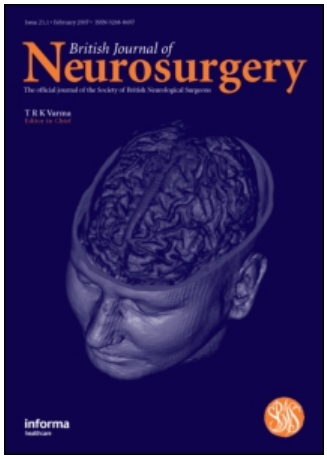

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Proceedings of the 151 Meeting of the Society of British Neurological Surgeons

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PROCEEDINGS

Proceedings of the 151 Meeting of the Society of British Neurological Surgeons

This meeting is being held on 9 – 11 April 2008 at the Arena and Conference Centre, Liverpool and is hosted by The Walton Centre for Neurology and Neurosurgery, Liverpool.

These abstracts are published in advance of the meeting in the order of presentation. If any papers are not subsequently read to the Society or are withdraw, an addendum will be issued in the next issue of the Journal.

ORAL PRESENTATIONS

Wednesday 9 April 2008

W4-01: Simvastatin in aneurysmal subarachnoid haemorrhage (STASH); a phase III randomised placebo controlled trial - progress report

P. J. Kirkpatrick[1], C. L. Turner[1], M.-Y. Tseng[1], A. D. Mendelow[2], P. J. A. Hutchinson[1], G. Murray[3] & M. Brown[1] ([1]On behalf of the STASH trial group. Addenbrookes Hospital, Cambridge, UK, [2]Dept of Neurosurgery, Newcastle General Hospital, Newcastle, UK and [3]Dept of Community Health Sciences, University of Edinburgh, Edinburgh, UK)

Objective: A pilot study demonstrated that acute statin therapy following aneurysmal subarachnoid haemorrhage ameliorates vasospasm-related delayed ischemic deficits, reduces frequency and intensity for rescue therapy, and improves long-term outcome at 6 months.[1,2] We are conducting a phase III multi-centre randomized-controlled trial to establish if this holds true in a larger population.

Methods: 1600 aneurysmal subarachnoid haemorrhage patients (age 18 – 65 years, onset $\leq$96 hours) will be randomized to receive daily oral Simvastatin 40mg or placebo for up to 21 days. Adverse clinical events will be recorded during the trial. Primary outcome measure is the modified Rankin Disability Score at 6 months. Secondary outcome measures are the Short Form 36 questionnaire (SF-36) at 6 months, the incidence, duration and need for delayed ischemic deficit (DID) rescue therapy, incidence and severity of sepsis, length of intensive care and total acute hospital stay and percentage of patients discharged directly home.

Conclusions: 130 patients (44 male, 86 female), have been recruited from 11 centres worldwide in 10 months, (mean age 50 years, range 21 – 65 years). 102 patients were WFNS grades 1 – 2 on arrival, 28 were grades 3 – 5. 49 patients were admitted to the intensive care unit, mean length of stay 12 days (range 2 – 42 days). 7 patients have died, 2 from rebleeds, 3 from DIDs, and 2 from DIDs with sepsis. There have been no unexpected adverse events. We have 6 month outcome data on 50 patients (98%). The trial has recently received favourable response from the British Heart Foundation which will allow recruitment to accelerate. Both UK and overseas Centres will be welcomed to participate and will receive appropriate funding support.

References

1 Tseng M-Y, Czosnyka M, Richards H, Pickard JD, Kirkpatrick PJ. Effects of acute treatment with pravastatin on cerebral vasospasm, autoregulation, and delayed ischemic deficits after aneurysmal subarachnoid hemorrhage: a phase II randomised placebo-controlled trial. *Stroke* 2005;36:1627 – 32.

2 Tseng M-Y, Hutchinson PJ, Czosnyka M, Richards H, Pickard JD, Kirkpatrick PJ. Effects of acute pravastatin treatment on intensity of rescue therapy, inpatient hospital stay and six-month outcome in patients after aneurysmal subarachnoid hemorrhage. *Stroke* 2007;38:(5):1545 – 50.

W4-02: Natural history of brainstem cavernous malformations

M. Javadpour[1,2], M. Tymianski[1], R. A. Willinsky[1], K. TerBrugge[1] & M. C. Wallace[1] ([1]Toronto Brain Vascular Malformation Study Group, Division of Neurosurgery, University of Toronto, Toronto, Ontario, Canada and [2]The Walton Centre for Neurology and Neurosurgery, Liverpool, UK)

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Objective: To determine the annual risk of occurrence of neurological events (new neurological deficit) in patients with brainstem cavernous malformations (CMs).
Design: Prospective cohort study. Data on 113 patients with brainstem cavernous malformations were prospectively collected between 1989 and 2003. Subjects: 80 patients (34 males, 46 females) were included in the study. 33 patients were excluded (15 lost to follow-up, 13 had treatment prior to or soon after their first assessment, 4 were referred for radiology opinion only, 1 died from an unrelated cause).
Outcome measures: Annual rate of occurrence of new neurological events, as assessed by clinic visits or telephone follow-up.
Results: Mean age at presentation was 39.7 (SD 14.9 years). Mode of presentation included focal neurological deficit (FND) in 72, seizures in 1, headache in 4, and incidental finding in 3. Radiological evidence of haemorrhage was observed in 50/72 patients who presented with FND. Over the period of follow-up (435 patient-years), 60 new events occurred, resulting in an annual event rate of 13.8%. The annual event rate was 14.6% if the initial presentation was FND, and 7.5% for those with other presentations. Of the 75 patients who had a neurological event at some point in time (either at presentation or during follow-up), 20 (26.6%) recovered fully. Full recovery was less likely in those who suffered multiple events.
Conclusions: Brainstem CMs carry a high risk of neurological events. The risk is highest in those who initially present with neurological deficit. Full recovery occurs in a quarter of patients.

W4-03: Do inhibitory molecules within the spinal cord inhibit CNS regeneration?

M. K. Hossain-Ibrahim[1,2], P. N. Anderson[1], A. R. Lieberman[1] & G. A. Solanki[2] ([1]University College London and [2]Birmingham Children's Hospital)

Objective: Spinal cord injury is typically irrecoverable as it results in abortive sprouting of axotomised neurons. This is mainly due to the poor response to injury of CNS axonal cell bodies, inhibitory molecules in CNS myelin and glial scarring. NG2, a Chondroitin sulphate proteoglycan, blocks neurite outgrowth in-vitro and is upregulated at sites of CNS injury. NG2 has been proposed as a major inhibitor of CNS axonal regeneration.
Methods: 190 (95 NG2-knockout; 95 wild-type control) age and sex matched mice were studied.

In the CNS, axonal tracers were used to identify attempted corticospinal and dorsal column axonal regeneration after spinal cord injury as well as injured dorsal roots regenerating at the DREZ and into the spinal cord.

In the PNS, various types of axonal injury were performed to determine how absence of NG2 affected axon regeneration and recovery from injury. Statistical analysis included measures of central tendency, Mann-Whitney and Student's t-test.
Results: In the CNS axonal regeneration was not seen in either experimental group. Absence of NG2 did not appear to influence CNS regeneration. PNS axons regenerated to the same extent and at the same speed in knockout and control mice.
Conclusion: NG2 is unlikely to be a major inhibitor of axonal regeneration after CNS injury. It is probably not necessary for regeneration or functional recovery following peripheral nerve injury.
Discussion: Research regarding other putative inhibitors of spinal cord regeneration will be discussed.

W5-01: Long Term Success of Microvascular Decompression in the Treatment of Trigeminal Neuralgia

V. A. Elwell, N. D. Mendoza & R. D. Illingworth (Charing Cross Hospital, London, UK)

Objective: To determine the long term success of microvascular decompression(MVD) in the treatment of trigeminal neuralgia.
Design: A prospective longitudinal cohort study of patients with trigeminal neuralgia who underwent posterior fossa craniectomy with the intention to treat by MVD was performed. Analysis was by postal questionnaire survey and review of collected data.
Results: 262 patients underwent surgical intervention with 265 operative procedures undertaken (204 MVDs, 21 partial nerve sections, 8 tumour resections, 3 explorations). The mean age at surgery was 55.9. The mean interval at follow-up was 108 months. 208 and 174 patients were followed up >24 and 60 months, respectively. 47 patients died during follow-up (mean: 102 months). Overall, 175 patients (67%) remained pain-free, 42 (16%) had minor recurrences, 42 (16%) had major recurrences, 2 (0.7%) had no improvement and 1 (0.3%) died during the post-operative period. 212 patients had definite operative findings (204 vascular compression, 8 tumours) whilst 50 patients had indefinite findings. 21 patients with indefinite findings underwent partial nerve section and of whom 13 (61%) remained pain free. Further analysis was performed in respect to patients who were followed up >5 years, those who died and those who developed bilateral pain.
Conclusions: The study continues to demonstrate the long term success of MVD in the treatment of trigeminal neuralgia and highlights the importance and use of a long term prospective follow up database in the assessment of a chronic neurological disorder.

W5-02: The Long Term Outcome of Microvascular Decompression for Trigeminal Neuralgia

Z. Sarsam, P. R. Eldridge & T. R. K. Varma (The Walton Centre for Neurology and Neurosurgery, Liverpool, UK)

Objective: Evaluation of the long term outcome of Microvascular Decompression (MVD) for Trigeminal Neuralgia (TGN) with emphasis on patient's perception of outcome and satisfaction.
Design: Data on demographics, clinical findings, imaging, operative findings and complications were collected from medical records. Questionnaires assessing the patient's perception of outcome were reviewed and statistical analysis of results carried out using Kaplan-Meier curves.
Subjects: A cohort of 372 patients operated on between 1982 and 2005 were available for review. Questionnaires were returned by 266 patients.
Outcome Measures:

Primary - Mean interval to pain recurrence, patient's view of outcome and satisfaction.
Secondary - Correlation of duration and type of symptoms to outcome, predictive value of imaging, operative findings, complications, and outcome of repeat MVD.

Results: The mean duration of TGN was 6.6 years, mean post operative follow up 7.5 years. Patients with atypical symptoms had poorer outcome with 65% pain relief compared to 70% in those with typical features. Patients with arterial compression had slightly better outcome compared to venous compression. Overall 84% of responders expressed satisfaction with the operative outcome, 69.5% were pain free at time of study, and 15% had residual pain more than 25%. Complications included CSF leak (7.5%), infection (4.5%) impaired hearing (6.5%). One patient developed a subdural haematoma and there were no deaths.
Conclusion: This is a large review of MVD which confirms the long term effectiveness of the procedure, and uniquely reflects patient's perception of the operation.

W5-03: Guidelines for treatment for trigeminal neuralgia report of a joint American Academy of Neurology and European Federation of Neurological Societies task force

J. M. Zakrzewska[1], G. Gronseth[1], N. Kitchen[2] & G. Cruccu[1] ([1]Eastman Dental Hospital, London, UK and [2]National Hospital for Neurology and Neurosurgery, London, UK)

Objective: To review evidence on diagnosis and treatment of trigeminal neuralgia (TN) and provide recommendations.
Design: Systematic review of the literature was carried out and critically appraised by an international panel.
Results: The diagnosis of classical TN must be based on clinical data alone, because there are no useful laboratory tests. In patients with TN MRI may be considered to identify patients with structural causes. Trigeminal sensory deficits, bilateral involvement, and abnormal trigeminal reflexes may identify symptomatic TN. Carbamazepine (stronger evidence) or oxcarbazepine (better tolerability) should be offered as first-line treatment for pain control while lamotrigine, and baclofen can be considered as second-line treatments. There is some evidence that patients with refractory TN prefer a surgical option earlier rather than late. Percutaneous procedures on the Gasserian ganglion are ablative and so result in varying degrees of sensory loss and by 5 years up to 50% of patients will have developed a recurrence. Gamma knife surgery results are similar to Gasserian ganglion procedures but pain relief and sensory loss can be delayed. Microvascular decompression has a mortality around 0.5% but pain relief occurs in 70% of patients at 10 years.
Conclusions: Carbamazepine and oxcarbazepine should be used as first line drugs. If these fail microvascular decompression may be considered over other surgical techniques to provide the longest duration of pain freedom.

W5-04: Facial electromyography of lateral spread response (LSR) as an adjunct to microvascular decompression for hemifacial spasm

S.-A. S. Price, N. K. Patel, N. Kane & H. B. Coakham (Frenchay Hospital, Bristol, UK)

Objective: To determine the value of monitoring lateral spread response (LSR) per-operatively, LSR being a measure of facial nerve ephaptic transmission.
Design: Cohort study. Subjects: 17 patients undergoing microvascular decompression from 2006 to 2007.
Outcome Measures: Abolition of LSR at end of procedure. Patient reported symptoms at telephone follow-up.
Results: Recordings were successfully made in 13 patients. LSR was abolished by the end of the operation in 11 cases: seven of these had complete relief and two had improvement in spasms; two patients had no improvement in symptoms. In one patient there was reduction in amplitude of the oris response with a significant improvement in symptoms. In the remaining patient the nerve was noted to be irritable with no change in the LSR: this patient had a temporary facial palsy but complete relief of spasm.

Conclusions: The abolition of the LSR was achieved in most patients and this usually coincided with removal of the offending vessel from the nerve, although correlation of electrophysiology with early clinical outcome is not perfect in some cases. In one re-exploration case, originally operated elsewhere, fluctuating changes in the oculis oris muscle potential led the surgeon to further decompress the nerve with resulting immediate relief of spasms and was felt to be very useful in guiding the surgery. Our early experience indicates that LSR monitoring is helpful particularly in re-explorations.

W5-05: Bilateral STN Stimulation for Parkinson's Disease: Comparison of Results Under General and Local Anaesthesia

C. L. Nicholson & A. Jenkins (Regional Neurosciences Centre, Newcastle General Hospital, Newcastle upon Tyne, UK)

Objective: To demonstrate that bilateral STN electrode implantation for Parkinson's disease using MRI targetting alone is as effective as targetting using MRI with intra-operative stimulation and clinical assessment.
Design: Retrospective cohort study Subjects: 31 patients, 16 implanted under local anaesthetic between 2003 and 2004, and 15 implanted under general anaesthetic between 2005 and 2006.
Outcome Measures: Pre- and post-operative UPDRS, MADRS and DRS 2 scores, and duration of surgery. Post-operative scores were recorded at 1 year.
Results: There were no significant differences between the groups in terms of age at diagnosis, age at surgery and pre- and post-operative UPDRS, MADRS and DRS 2 scores. Operating time was significantly reduced in the general anaesthesia group. Duration of hospital stay was the same for both groups. There was no significant morbidity and no mortality in either group.
Conclusions: Bilateral STN electrode implantation for PD using MRI targetting only does not appear to be less effective than implantation using both MRI and awake stimulation. The total operating time is less with general anaesthesia and in addition, the procedure is better tolerated by patients.

W5-06: Hemichorea-hemiballismus following subthalamic infarction treated with unilateral globus pallidus internus deep brain stimulation

H. Hasegawa, N. Mundil, M. Samuel & K. Ashkan (King's College Hospital, London, UK)

Objective: To describe a rare case of a severe refractory hemichorea-hemiballismus resulting from infarction of the right subthalamic nucleus, which was successfully treated with unilateral globus pallidus internus deep brain stimulation.
Subject: A 56 year old man who had sustained a haemorrhagic stroke of the right subthalamic nucleus developed hemichorea-hemiballismus affecting his left arm four days after presentation. The patient could not use his left arm for any task due to the severity of the movement disorder. The arm was also prone to frequent trauma because of uncontrollable movements. He had received medical treatment over a period of three years without any benefit.
Result: Deep brain stimulation of the right globus pallidus internus resulted in immediate improvement of symptoms. Six months after surgery the patient is free of ballistic movements and is able to perform simple tasks with the left arm and hand including washing up and opening doors.
Conclusion: To the best of our knowledge, this is the first reported case of hemichorea-hemiballismus successfully treated with deep brain stimulation of the globus pallidus internus. This represents a new indication for this well established technique.

W5-07: Visual Field Deficits after Selective Trans-Sylvian Amygdalohippocampectomy

A. A. Khan & W. P. Gray (Wessex Neurosciences Centre, Southampton General Hospital, Southampton, UK)

Objective: To identify and evaluate the incidence of Visual Field Deficit (VFD) after selective Trans-Sylvian Amygdalohippocampectomy (TAH) performed consecutively by one surgeon and its clinical significance.
Design: A retrospective analysis of Goldmann Perimetry charts using the I4e stimulus as standard. Subjects: Total 27 patients; Age range 5–55 yrs. Mean follow up 2 years 7 months. All patients underwent TAH for epilepsy with a histological diagnosis of mesial temporal sclerosis (MTS).
Results: Of 27 patients 18 (67%) had VFD in either or both eyes. The eye ipsilateral to the operation was more likely to have deficits closer to the central point of fixation than that contralateral to the operation. Of 54 eyes (27 patients), 24 eyes (44%) had a deficit. These defects arose in 9 patients in both eyes and in 6 patients in the ipsilateral eye only. 22 of 27 (81%) patients were seizure free (Engel 1). Patients with VFD were more likely to have good seizure control, 16 of 18 patients (89%) Engel 1, compared to those with no VFD, 6 of 9 patients (67%) Engel 1. 15 Engel 1 patients (56% of all patients) could have obtained a driving license using the smaller I4e stimulus, a less lenient criteria than the III4e stimulus stipulated by the DVLA.
Conclusions: Studying post-operative Visual Fields (VFs) provides an insight into the anatomy of resection involving the optic pathway and its effect on patients'ability to drive. Awareness of the

potential effect of resection on VFs could guide in future surgical planning.

Thursday, 10 April 2008

T1-01: Current neurosurgical trainees'perception of the European Working Time Directive and shift work

G. A. Fellows, M. J. Tait, M. C. Papadopoulos & B. A. Bell (St George's Hospital, University of London, UK)

Objective: The shift system introduced in response to the European Working Time Directive has had an enormous impact on the running of neurosurgical units in the UK. This study seeks to establish current provision of out of hours cover and what has been the effect of the introduction of shifts in three main areas: patient safety, training and ''work/life balance''.
Design: The on-call registrar at each UK neurosurgical unit was contacted by telephone. Data regarding current emergency provision were sought. Registrars who had worked both on-calls and the shift system during their career as a neurosurgical registrar were asked to make a comparison.
Results: Data were collected from all 33 UK units. Twenty-two still use a traditional 24-h on-call system. Twenty-one on-call rotas were classed as non-resident although 12/21 of those officially on non-resident rotas were in fact resident whilst on call. Twenty-two registrars had worked both systems as a neurosurgical registrar. Twenty-one (95.45%) felt that traditional on-calls gave better clinical exposure. Twenty-one (95.45%) felt that on calls allowed the provision of better patient care. Nineteen (86.36%) felt that on-calls were safer. Thirteen (59.09%) reported that they were more tired when doing shift work than on-calls. Fourteen (63.63%) found that the on-call system gives more useful spare time and more time to deal with family commitments.
Conclusions: Current neurosurgery registrars feel the shift system is less safe, harmful to training and worse in terms of work/life balance. More than one-third of units are claiming to have non-resident on-call systems in order to appear compliant with EWTD when registrars are in fact resident.

T2-01: Analysis of Wall Shear Stress levels in models of a partially occluded large basilar tip aneurysm

J. Bannister[1], M. Foroughi[2], D. M. O'Doherty[1], T. O'Doherty[1], R. Nannapaneni[2] & R. Hatfield[2] ([1]Cardiff School of Engineering and [2]University Hospital of Wales, Cardiff)

Objective: To find how wall shear stress (WSS) levels vary according to the percentage of occlusion within a basilar tip aneurysm.
Design: Computational fluid dynamics (CFD) modelling was carried out by taking 3D co-ordinates from DICOM images of a large Basilar tip aneurysm. The CFD modelling was undertaken using Fluent 6.2, and the computation was run using unsteady inlet flow with a standard k-e turbulence model. Assumptions made included that the arterial walls are solid & non-elastic entities and that blood is an incompressible Newtonian fluid. To highlight the WSS distributions coloured contour plots were used. An anonymous DICOM image set was provided of a giant basilar tip aneurysm. Analyses of the WSS at various regions of the aneurysm and an untreated aneurysm was modelled in 3D to assess that the modelling process was not unreasonable.
Results: The untreated and 70% treated models showed a low WSS distribution over the dome of the aneurysm with a higher concentration at the neck. The 80% and 90% treated models showed reduced WSS concentrations at the neck. The 95% occluded model showed highly elevated levels of WSS at the neck, caused by the dramatic change in blood flow direction.
Conclusions: In this analysis and model of basilar tip aneurysm an optimum range of aneurysm occlusion of between 80%–90% is required to minimise Wall Shear Stress and possibly reduce risk of further aneurysm growth.

T2-02: S100B and GFAP in brain extracellular fluid: can they assist in prognostication of outcome after SAH?

A. G. Kolias[1], J. Sen[3], S. Sen[3], J. Hillman[2], A. Petzold[1], G. Keir[1] & A. Belli[3] ([1]Dept. of Neuroimmunology, Institute of Neurology, Queen Square, London, UK; [2]Dept. of Neurosurgery, University Hospital in Linkoping, Sweden and [3]Division of Clinical Neurosciences, University of Southampton, UK)

Objective: A variety of grading scales have been put forward for predicting outcome after SAH. The most widely used (Hunt & Hess, WFNS) rely on the assessment of level of consciousness and other clinical findings. This may lead to inter-observer variability, whereas the ability of both scales to clearly differentiate between their grades has been questioned. Our hypothesis is that quantification of astroglial proteins S100B and GFAP in brain extracellular fluid (ECF), may improve the prognostic accuracy after SAH.
Design and subjects: This longitudinal study involved 24 patients (mean age 49, range 29-67) admitted due to SAH to NICU.
Methods: 100 kDa molecular weight cut-off microdialysis catheters (CMA Microdialysis, Sweden) were used. ECF S100B and GFAP were measured using in-house ELISA techniques. Outcome measures: Glasgow Outcome Scale (GOS) at 6 months,

ECF S100B levels in 24 patients, ECF GFAP levels in 11 patients.
Results: Patients with a poor outcome (GOS of 1, 2 or 3, n = 15) were found to have 2.5 times higher mean S100B levels (p = 0.0056) than patients with a favourable outcome (GOS of 4 or 5, n = 9). Comparison of maximum S100B levels was weaker but still significant (p = 0.045). GOS at 6 months inversely correlated with mean ECF S100B (p = 0.005, r = −0.554, n = 24). Patients with a poor outcome (n = 7) were found to have 5 times higher maximum GFAP levels (p = 0.037) than patients with a favourable outcome (n = 4).
Conclusions: ECF S100B and GFAP may be a useful adjunct in the prognostication of outcome after SAH but further studies are warranted to appraise their value in the NICU.

T2-03: Relationship between C-reactive protein levels and delayed neurologic deficits in good-grade patients with aneurysmal subarachnoid haemorrhage

K. T. Tsang, J. M. Barber, S. Bavetta & H. L. Low (Queens Hospital, Romford, UK)

Objective: Delayed neurologic deficits (DND) following subarachnoid haemorrhage (SAH) occur in 20–45% of patients with a significant proportion being related to ischaemia. There is increasing evidence to show that inflammation has a significant role in its pathogenesis. In this study, we looked to see whether there was an association between C-reactive protein (CRP) levels and DND. Additionally, we sought to determine the usefulness of CRP as a predictor of DND in SAH patients.
Design: Prospective study, analysing data from 20 consecutive SAH patients (WFNS grade 1–2). CRP levels were obtained daily from days 0 to 14 post-SAH. The relationships between CRP levels and age, vasospasm on CT angiogram, white cell count, Fisher grade, type of treatment, onset of DND and other concurrent illnesses were determined.
Results: CRP levels were raised in all SAH patients (average 9.2 mg/L, range <5 to 49 mg/L) especially by day 5 post-SAH. However patients who developed DND had a CRP rise of at least 500% above baseline levels whereas CRP levels failed to increase more than 200% above baseline in non-DND patients. Moreover, the onset of DND was preceded by a rise in CRP levels in all patients.
Conclusion: CRP levels rise significantly 4-5 days post-SAH and fall to baseline levels by day 13. Higher CRP levels are associated with an increased risk of developing DND independent of other variables. CRP estimation could potentially be used to predict the onset of DND in good grade SAH patients.

T2-04: The role of apoptotic pathways in vasospasm

J. Cahill & J. Zhang (James Cook University Hospital, Middlesbrough, UK)

Objective: The morbidity and mortality rate in patients with subarachnoid haemorrhage (SAH) remains unacceptably high. Although vasospasm is one of the most intensely studied topics in neurosurgery, the aetiology remains elusive. Using an animal model of subarachnoid haemorrhage, the role of p53 caspase dependent and independent, and the mitochondrial apoptotic pathways were examined at 24 and 72 hrs in the basilar artery.
Design: 140 Sprague-Dawley rats were divided into the following groups:- Sham (n = 21), non-treatment (SAH + DMSO) (n = 42) and treatment (SAH + PFT-a) (n = 42) groups. The basilar artery was harvested at 24 and 72 hrs and used for Western blot, histology and immunohistochemical analysis.
Results: Histological analysis indicated severe vasospasm at the 24 hr time point which persisted to 72 hrs, which was not reflected by the clinical parameters measured, which improved at the 72 hr time point. Western blot and immunohistochemical analysis indicated that p53 may have a dominant role in initiating the apoptotic cascades with regard to vasospasm.
Conclusions: p53 may play an important role in the development of vasospasm after a SAH. In this experiment vasospasm was found up to 72 hrs however the apoptotic markers examined were only found up to 24 hrs.

T2-05: Outcome of endovascular intervention for post-SAH vasospasm - Will an on-call service be useful?

S. P. S. Howarth, A. Ray, S. Wuppalapati, G. A. Roberts, N. T. Gurusinghe & T. Patankar (Royal Preston Hospital, Preston, UK)

Objective: To study the outcome of early endovascular intervention for the management of post-SAH vasospasm, and to determine whether an on-call neuroendovascular service will be useful.
Design: Retrospective review of patients treated with an interventional endovascular procedure for clinical vasospasm following an aneurysmal SAH. Outcome Measures: Time to treatment following clinical vasospasm and GOS at discharge.
Results: Out of 118 patients with aneurysmal SAH, 18 (6 male, 12 female) required endovascular intervention for vasospasm after medical treatment failed to produce clinical improvement. Intra-arterial nimodipine, transluminal Balloon Angioplasty or a combination was used. Median age was 46 years. Median time to intervention was 7 days post-SAH. Overall, 10 patients had a good outcome, 3 were

severely disabled and 5 died. 12 patients were treated within 12 hours (mean 9 hours). All 5 patients treated within 8 hours and 5 of 7 patients (71%) treated by 12 hours made a good recovery. Of the 6 patients treated after 12 hours, 3 (50%) died. 10 patients had intra-arterial nimodipine alone, with 4 requiring repeat infusions. 1 patient had balloon angioplasty, and 7 underwent both procedures. Multiple procedures were done in 8 patients. 8 patients had presented with WFNS Grade 4–5, of which 4 had a good outcome.

Conclusions: Early and repeated endovascular intervention may lead to better results in the management of vasospasm. As timing of treatment can determine outcome, an on-call service is recommended.

T2-06: Intraoperative ultrasonographic flowmetry and fluorescence angiography prevent neurological deficit in vascular neurosurgery

H. J. Kirk, P. Rao, K. Seow, J. Fuller, N. Chandran & V. G. Khurana (Department of Neurosurgery, The Canberra Hospital, Canberra, ACT, Australia)

Objective: Microvascular ultrasonography and fluorescence angiography can be used intraoperatively to quantify (ultrasound) and qualify (angiography) blood flow in local ''at-risk'' vessels before and after surgical intervention. As inadvertent vessel compromise represents a major cause of neurological deficit following neurovascular surgery, the purpose of this pilot study was to assess both of these technologies in terms of their ease of implementation and interpretation, utility, safety and reliability.

Methods: Patients were prospectively invited to participate and all patients gave written informed consent for the use of our microultrasound (Transonic Systems) and fluorescence-capable microscope (Leica Microsystems OH4). Intraoperative flow measurements were recorded from at-risk vessels before and after surgical intervention, as were blood pressure and $PaCO_2$ at those times. At-risk vessels were also imaged via fluorescence angiography at appropriate intervals. Any postoperative neurological deficits were noted.

Results: Twenty seven patients undergoing 30 craniotomies were enrolled. Operations included 19 cases of aneurysm clipping or exploration, 3 of AVM excision, 1 dural AV fistula disconnection, 1 cavernoma excision, 1 EC-IC bypass and 5 tumour resections. Intraoperative ultrasound technology facilitated the detection of two inadvertent vessel compromises. In AV fistula and AVM surgery, markedly reduced draining vein flow rates were confirmed quantitatively immediately before final surgical disconnection was carried out. Fluorescence angiography detected residual aneurysm filling after definitive clipping in one patient and demonstrated that an AVM was not truly disconnected in one further patient. One person awoke with a stroke presumably from an embolic event undetected by ultrasonography.

Conclusions: Ultrasonographic flowmetry and fluorescence angiography provide immediate feedback regarding vessel patency. Clip-related arterial compromise and local vasospasm are detectable by these technologies, but an embolic event may escape detection. These technologies were found to have a broad utility in intracranial surgery, and were safe, rapidly performed, easy to interpret, and generally reliable.

T2-07: Effects of fluid therapy following aneurysmal subarachnoid haemorrhage

M.-Y. Tseng, P. J. Hutchinson & P. J. Kirkpatrick (Addenbrooke's Hospital, Cambridge, UK)

Objective: We sought to determine effects of various fluid supplements on clinical outcome in patients following aneurysmal subarachnoid haemorrhage (aSAH).

Design: Post-hoc analysis of outcome and laboratory data of 160 adult aSAH patients collected as part of two unrelated randomised controlled trials. Outcome Measures: Favourable outcome was defined as good recovery or moderate disability on Glasgow Outcome Scale (GOS). Data were compared between patients with/without synthetic colloid fluid therapy or favourable/unfavourable outcome using repeated measurement ANOVA with Dunnettâ's correction and multivariate regression modelling.

Results: All of the 160 patients received intravenous fluid supplements with crystalloids; 122 (76.3%) also received synthetic colloids (4% succinylated gelatine or 6% pentastarch). A higher daily dose of synthetic colloids for initial resuscitation seemed to be associated with more requirements for blood transfusions ($p = 0.003$) and occurrence of vasospasm in poor-grade patients ($p = 0.081$). Compared with patients not receiving synthetic colloids, those receiving synthetic colloids had increased haemodilution, elevated inflammatory profiles, and decreased duration and strength of intact cerebral autoregulation. Multivariate analyses identified that blood transfusions (odds ratio, OR 3.38, $p = 0.035$) were associated with unfavourable outcome at discharge. Colloid fluids (OR 2.53/L/day, $p = 0.025$) promoted unfavourable outcome at 6 months (OR 4.45, $p = 0.035$), while crystalloids decreased unfavourable outcome (OR 0.27/L/day, $p = 0.005$). Associations between synthetic colloids and crystalloids with GOS at 6 months were dose-related.

Conclusions: Intravenous fluid therapy using synthetic colloids or blood transfusions may be associated with increased unfavourable outcome following aSAH.

T2-08: Age-dependent neuroprotective effect of acute erythropoietin therapy following aneurysmal subarachnoid haemorrhage: a randomised double-blind controlled trial

M.-Y. Tseng, P. J. Hutchinson, H. Richards, M. Czosnyka, J. D. Pickard & P. J. Kirkpatrick (Addenbrooke's Hospital, Cambridge, UK)

Objective: We have demonstrated that acute systemic erythropoietin (EPO) therapy reduces vasospasm and delayed ischaemic deficits (DID) following aneurysmal subarachnoid haemorrhage (aSAH). In this post-hoc analysis, we aimed to investigate whether the neuroprotection is age-dependent.
Design: Randomised, double-blind, placebo-controlled trial of intravenous EPO 30,000 IU or placebo every 48 hours for a total of 3 doses. Subjects: Eighty patients (age range 24-82 years) within 72 hours of aSAH. Outcome measures: Primary endpoints were incidence, duration and severity of vasospasm and impaired autoregulation on transcranial Doppler. Secondary endpoints were incidence of DID and clinical outcome at discharge.
Results: Fifty patients were aged less than 60 years (26 placebo, 24 EPO) and 30 were over 60 years of age (14 placebo, 16 EPO). In the younger patients, vasospasm and severe vasospasm were reduced in the EPO group by 30.8% (t-test, $p = 0.036$) and 30.2% (t-test, $p = 0.019$) respectively, but no difference was found in the older patients. Similarly, only in the younger patients was vasospasm-related DID and unfavourable outcome at discharge reduced in the EPO group by 22.1% (t-test, $p = 0.066$) and 29.8% (t-test, $p = 0.028$) respectively. Impaired autoregulation was shortened by EPO in the younger patients by 4.7 days on the ipsilateral side (Mann-Whitney test, $p < 0.001$) and by 2.9 days on the contralateral side (Mann-Whitney test, $p = 0.003$), and no difference was found in the older patients.
Conclusions: EPO-related neuroprotection seems to be age-dependent. This data is of importance in terms of the design of phase III studies.

Reference

1 Tseng MY, Richards H, Czosnyka M, Pickard JD, Kirkpatrick PJ. Acute systemic erythropoietin therapy reduces cerebral vasospasm and delayed ischemic deficits after aneurysmal aubarachnoid hemorrhage: a phase II randomized, double-blind, placebo-controlled trial. *J Neurosurg* 2007;106:A768.

T2-09: Long term neuropsychological impact of Sub-arachnoid haemorrhage and its treatment on day-to-day life of patients: A case control study

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Objective: Long term deficits in patients of SAH are thought to be related to treatment, although this is controversial. We set out to evaluate a set of patients treated at our centre at least 18 months after the ictus and treatment using a battery of neuropsychological tests which were relevant to daily life.
Methods: A neuropsychological assessment was conducted for all patients who agreed to participate in the study and had onset of subarachnoid haemorrhage at least 18 months earlier. The subjects and 30 controls were assessed in detail using the above mentioned novel battery of tests. The scores were recorded along with demographic details. The aspects tested included visual disorders, attention, memory, mood and executive functions.
Results: 44 subjects agreed to take part. Of these, 34 were female and 10 were male. The mean age was 54.4 and the range 36-76 years. 31 patients had the aneurysm coiled, 8 clipped and 5 did not have an aneurysm as the cause of their SAH. Only nine patients were working either full time or part time at the time of assessment. Patients in the SAH group had significant deficits of attention and executive functions ($p < 0.05$) but not memory ($p = 0.09$) when compared to normal controls. MMSE scores in the SAH group were not significantly impaired ($p = 0.38$). Within the three subgroups of the SAH patients (coiled, clipped and non-aneurysmal) the deficits were independent of treatment.
Conclusions: Our results reflect a change in the UK practice in treating aneurysms. After >18 months post ictus, attention and executive functions were found to be significantly impaired in SAH patients as compared to controls. The deficits do not depend on treatment. Our data suggests that patients with SAH are left with significant cognitive deficits which may prevent them from getting back to work. The non-aneurysmal SAH group needs further evaluation since they tend to do better cognitively.

T2-10: Retreatment after endovascular coiling of ruptured cerebral aneurysms

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Objective: To determine the rate of re-treatment of ruptured cerebral aneurysms treated by endovascular coiling
Design: Retrospective study of clinical notes, radiological reports and radiological images. Subjects: Patients undergoing endovascular coiling of ruptured cerebral aneurysms between 1st January 2001 and 31st December 2003 Outcome measures: Re-bleeding or re-treatment of the target aneurysm.
Results: 298 patients (318 aneurysms) underwent coiling during the review period. The immediate radiological occlusion was complete in 257 (86%).

19 patients died and 14 were lost to follow up. Clinical follow-up was available for the remaining 265 patients. During the follow-up period (range 1-77, mean 29, median 26 months), 3/265 (1.13%) patients had re-bleeding from a coiled aneurysm; one patient died. One of the re-bleeding episodes occurred from an aneurysm deemed to have been completely occluded on initial angiography. Radiological follow-up (Magnetic Resonance Angiography, MRA) was available in 235/298 (79%). During the follow-up period (range 1-77, mean 24, median 21 months), 7/235 (2.97%) patients required re-treatment of their aneurysms. Time to re-treatment ranged from 11-67 months (median 41.5 months).
Conclusion: Re-treatment was deemed necessary in 3% of patients who had radiological follow-up. Long term follow-up imaging is required to detect recurrences after endovascular occlusion.

T2-11: Incidence of seizures in clipping vs. coiling of middle cerebral artery aneurysms

S. Akmal, Y. Yap, Y. C. Gan, S. Zygmunt & C. H. A. Meyer (Queen Elizabeth Hospital, Birmingham, UK)

Objective: The reported incidence, timing, and predictive factors of perioperative seizures and epilepsy after subarachnoid haemorrhage have differed considerably because of lack of uniform definitions and variable follow up periods[1]. Endovascular treatment of aneurysms by coil embolization avoids craniotomy and thus potentially reduces the risk of patients developing post operative seizures[2].

The aims of the study were:

To determine the overall incidence of seizures post coiling and post clipping in middle cerebral artery aneurysms (MCA) presenting as acute subarachnoid haemorrhage.

To compare the incidence of seizures in clipping vs. coiling.

To determine if there is a statistical significance of developing seizures related to temporal lobe haematoma or Fisher grading.

Methods: Single institute study comprising a retrospective review of cases note and operative notes of patients treated by either coiling or clipping from 2000-2007.

Results: 98 patients with MCA were identified comprising 33 males, 65 females. There were 64 clippings, 29 coiling, 2 failed coiling, 1 failed clipping and 2 had combination of coil embolisation and clipping of aneurysm. 49 were right sided aneurysms and 45 left. aneurysm. 1/29 (3.4%) developed seizure post coil embolisation of aneurysm. 21 (32.8%) developed seizures post craniotomy and clipping of aneurysm. 21 patients known to have seizures preneuroradiological and neurosurgical intervention. Other factors related to the development of seizures in our series include clot in the frontal lobe, alcoholics, ischaemia or vasospasm intraprocedure.

Conclusions: From our preliminary results, the risk of developing epileptic seizures after surgery for aneurysms is around 10 times than after coiling of aneurysms.

References

1 Chih-Lung Lin, Aaron S. Dumount, Ann-Shung Lieu, Chen-Po Yen, Shiuh-Lin Hwang, Aij-Lie Kwan, Neal F. Kassell, Shen-Long Howng. Characterization of perioperative seizures and epilepsy following aneurysmal subarachnoid haemorrhage. *J Neurosurgery* December 2003;99:978–985.

2 Byrne JV, Boardman P, Ioannidis I, Adcock J, Traill Z. Seizures after aneurysmal subarachnoid haemorrhage treated with coil embolization. *Neurosurgery* 2003 Mar;52(3):545–552.

T2-12: Audit of Standard Flow Extra-Cranial Intra-Cranial bypass surgery

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Objective: Superficial temporal to middle cerebral artery bypass grafting remains a controversial procedure for the treatment of occlusive stroke. A recently reported population based study in the US showed that the procedure is often carried out by hospitals or surgeons undertaking only one procedure per year and is associated with a mortality rate approaching 5%.

To describe a single surgeon's experience of undertaking standard flow type of extracranial-intracranial (ECIC) bypass and demonstrate that it is a successful treatment in select groups of patients.
Methods: A retrospective review of 60 patients that had undergone ECIC bypass surgery under one consultant neurosurgeon. The reason for surgery and pre-operative morbidity based on Glasgow outcome scores was assessed. Complications from the operation, post-operative morbidity and mortality and effectiveness of the procedure were examined. All patients underwent pre-operative imaging.
Results: The Glasgow outcome score improved in 4 patients post-operatively compared with a preoperative assessment. Long term complications occurred in 6.7%. Complications occurred more frequently in the group undergoing surgery for tumour or aneurysm removal ($p = 0.019$). Mortality in the cohort was 1.7%. All patients who underwent post-operative imaging had patent grafts (90%).
Conclusions: This surgery can be a safe and effective treatment when performed by an experienced neurosurgeon. Its role is well defined for revascularisation when vessels are sacrificed for tumour or aneurysm removal. The Japanese ECIC Bypass Trial (JET) should further clarify the place of ECIC bypass surgery in cerebrovascular disease.

T2-13: High flow EC/IC bypass for complex anterior circulation aneurysms

H. C. Patel, M. Teo, N. Higgins & P. J. Kirkpatrick (Addenbrooke's Hospital, Cambridge, UK)

Objective: High flow extracranial to intracranial bypass may be required in patients (that have failed parent artery occlusion) with giant anterior circulation aneurysms. We report on the process and outcome of our early experience of performing high flow bypass in patients with complex anterior circulation aneurysms.
Methods: Retrospective review of patients that required an EC/IC bypass for treatment of complex anterior circulation aneurysms.
Outcome measures: The process (surgery time, length of hospital stay) and the outcome (graft patency, surgical complications, discharge destination, and outcome on outpatient clinic review.
Results: 8 patients were identified. 5 patients had a carotico-opthalmic aneurysm, 3 patients had an intracavernous aneurysm, and 1 patient presented with an intracranial carotid dissection. The median operation time was 7 hours, and median hospital stay was 20 days. All patients demonstrated reduced filling of the aneurysm and tolerated post operative parent vessel occlusion. One patient developed a post operative subdural collection (managed conservatively), and one patient required early graft revision. Discharge destination was home in 7/8 patients. All grafts were patent at outpatient review (median - 5 months). Persistent morbidity (dysphasia) was observed in one patient. One patient required revision surgery for aneurismal dilatation of the graft.
Conclusions: We have observed that a high flow bypass from the M2 portion of the middle cerebral artery to the extracranial carotid is sufficient to revascularise a hemisphere before parent vessel occlusion. Although it remains a technically and physically challenging procedure, good graft patency rates and low surgical morbidity can be achieved.

T2-14: Epileptogenesis and seizure control following stereotactic radiosurgery for arteriovenous malformation

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Objective: The aim of the study was to assess severity and/or frequency of epileptic seizures associated with AVM following radiosurgery. Reduction in severity and/or frequency of seizures is often seen even when the primary object of treatment, namely to obliterate the lesion, is less than fully achieved. However, in the immediate post-treatment period there can be a short term increase in epileptic activity which we have observed even in some patients where epilepsy was not an initial feature.
Design: A series of 242 (m = 132, f = 110) patients, consecutively treated over an 8 year period, were retrospectively assessed with respect to seizure activity. These were then classified according to age, other clinical features, size and site of AVM, and dosimetric considerations.
Results: 41% of patients (n = 100) presented with epileptic fits. Short and longer term effects on seizure activity in these and all other sub-groups will be discussed. A sub-group exists consisting of patients who develop seizures following radiosurgery, having previously been seizure free. Furthermore, this sub-group can be further sub-divided into those who develop such seizures in the immediate post-treatment period (within 24hrs), and those who develop seizures at a time remote from treatment (up to 1 year), when partial resolution of the AVM might be presumed to have started.
Conclusions: Sub-groups of patients undergoing radiosurgery for treatment of AVM can be identified as being at relatively increased risk of fits following treatment. Such patients should probably be treated with short to medium term courses of prophylactic anti-convulsants.

T4-01: The use of electromagnetic (EM) guidance in placement of ventriculo-peritoneal (VP) shunts. A technological advance in the management of hydrocephalus

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Objective: To evaluate EM guidance in VP shunt placement. EM guidance is a technique utilizing image guidance that can be used without rigid head fixation, using an adhesive forehead reference marker and a EM stylet that can be placed within the ventricular catheter allowing real-time tracking into the ventricular system. This is especially suitable for use in the paediatric population.
Design: A retrospective analysis of all shunts placed using EM guidance. Subjects: All children undergoing EM guided shunt placement from Jan 2006 to Oct 2007 for slit ventricle syndrome, complex hydrocephalus or small ventricles. Outcome measures: Number of passes to cannulate ventricle; early shunt blockage, early shunt infection; early resolution of clinical symptoms.
Results: There were 146 shunt procedures from Jan 2006 to Oct 2007 of which 23 patients underwent EM guided shunt placement. All 23 ventricles were cannulated with a single pass. The mean age was 5.5 yrs (range 6months to 13yrs). There was 1 immediate complication of overdrainage which required

shunt revision, 1 CSF infection requiring external drainage, 1 superficial abdominal infection, 3 ventricular catheter blocks requiring revision and one abdominal failure (conversion to VA shunt). All but one patient had resolution of symptoms in clinic review (mean follow up 8 months, range 1-25 months).
Conclusions: EM technology is simple to use and of great benefit in complicated hydrocephalus. We advocate the use of EM in complicated cases and propose a randomized trial in all shunt placements in order to investigate the benefits of EM further.

T4-02: The management of hydrocephalus in children with posterior fossa tumours: the role of pre-resectional endoscopic third ventriculostomy

R. Bhatia, M. Tahir & C. L. Chandler (Kings College Hospital, London, UK)

Objective: To determine the incidence of complications and outcomes associated with a primary management policy of endoscopic third ventriculostomy (ETV) prior to posterior fossa tumour resection in a single paediatric neurosurgical unit.
Methods: Between July 1999 and August 2007, 59 children with posterior fossa tumours underwent surgical resection. Patients were retrospectively categorised into no ($n = 16$), mild (6), moderate (22) or severe (15) hydrocephalus on admission. 37 patients underwent ETV within (mean) 1.5 days of admission, and of those, 32 (87.1%) exhibited significant improvement in presenting symptomology immediately after ETV. Average time between ETV and resectional surgery was 4.6 days (range 1-26 days). 4 patients underwent pre-resectional ventriculoperitoneal shunting or external ventricular drain insertion. 16 patients did not have any form of pre-resectional CSF diversion.
Results: Complications arising post-ETV included CSF infection/meningitis ($n = 2$) and bleeding ($n = 1$). One procedure was abandoned due to severely distorted anatomy. 5 patients required ventriculoperitoneal shunt placement at a later date (follow-up of 7.5 years). There was a significant association between increasing severity of hydrocephalus pre-ETV and increased number of complications ($p = 0.03$, Chi Square test); but no significant relationship between type of tumour and complication rate ($p = 0.157$).
Conclusions: The use of pre-resectional ETV at this institution is an effective and safe procedure with a high success rate at up to 7.5 years of follow-up. We believe that all paediatric neurosurgical institutions should review their practice regarding hydrocephalus associated with posterior fossa tumours in the light of the controversy surrounding pre-resectional CSF diversion.

T4-03: Middle fossa arachnoid cysts (MFAC) treated with endoscopic fenestration. A series of thirty eight patients in two centres

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Objective: The optimal management of middle fossa arachnoid cysts is still a point of debate within the neurosurgical community. We reviewed the combined management experience of two specialist tertiary centres in MFAC treatment with endoscopic fenestration in a mixed population of adults and children.
Design: Multicentre retrospective case note review with prospective follow up. Subjects: Thirty eight patients treated over a six year period. The same surgical technique was used in both centres for all patients.
Outcome Measures: Clinical improvement and neuroradiological changes at follow-up, post operative complications and benchmarking against recent literature for different surgical strategies.
Results: 89.5% of patients were improved clinically at the last follow up (mean follow up twenty two months). In four patients a second surgical procedure was required. Eight patients experienced a post operative complication but only three required further surgery.
Conclusion: Endoscopic fenestration for MFAC is a safe and effective procedure. The results are similar to those reported in the literature for microscopic fenestration with minicraniotomy but with less post operative complications and morbidity.

T4-04: Endoscopic surgery for colloid cysts: clinical and radiological outcome

A. Taha, P. Gan, A. R. Walsh, G. Solanki & G. Flint (Queen Elizabeth Hospital, Birmingham, UK)

Objective: Colloid cysts of the IIIrd ventricle may be treated in a variety of ways. Surgical procedures include transventricular and transcallosal approaches, stereotactic aspiration, insertion of bilateral ventricular shunts and, more recently, endoscopic procedures. We have been performing endoscopic reduction or excision of colloid cyst since 1997 and have reviewed the clinical and radiological outcome of this procedure.
Design: Retrospective case note review of patients who underwent endoscopic reduction or removal of their cysts, between April 1997 and December 2006. Subjects: 26 patients, 19 males and 7 females, with a mean age of 44 years, range 24 to 70. The follow-up interval varied from 6 to 72 months. All procedures were performed with a rigid endoscope.
Outcome measures: Radiological outcome: size of cyst and ventricles. Clinical outcome: symptom progression. Failure was defined as the need for a

further surgical procedure. Complications of the procedure were also audited.

Results: All 26 patients had pellucidotomy as a preliminary manoeuvre and 2 had IIIrd ventriculostomy as a supplementary manoeuvre. 2 patients had previously undergone insertion of bilateral ventriculoperitoneal shunts. 6 patients underwent aspiration of their cyst, 8 had thermal reduction of the lesion and rongeur extraction of the tumour was effected in 12 cases. Postoperative MR scans were available for all 26 patients. These images confirmed total removal of the cyst in 10 of the 26 cases. The lesion was seen to be reduced in volume in another 14 cases and 2 patients showed no change in cyst size. Ventricular size was reduced in 22 out of 26 patients, unchanged in 2 cases and increased in 2 patients. Presenting symptoms resolved in 18 of the total group of 26 patients, improved in another 7 and remained unchanged in 1 patient. We encountered 1 chronic subdural haematoma (requiring burr hole drainage), 1 case of meningitis and 1 case of hypopituitarism. Progressive hydrocephalus, requiring VP shunting, developed in 2 cases. 2 patients were left with persisting with memory deficits. There was no mortality.

Conclusions: We have found endoscopic surgery for colloid cysts to be a useful means of treatment with a 24 out of 26 successful radiological outcome, as defined by total removal of the cyst or reduction in ventricular size. We achieved total removal of the cyst in over a third of our cases. Clinical outcome was good in 25 of the 26 cases, as judged by improvement in presenting symptoms. Ventriculoscopy is a minimally invasive way of treating these tumours, with low complication rate and it does not preclude the subsequent use of open craniotomy or CSF diversion, if the primary procedure fails to control the symptoms or relieve the hydrocephalus.

T4-05: Endoscopic biopsy for intra- and peri-ventricular lesions: diagnostic accuracy, safety and control of hydrocephalus over a 20-year period

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Objectives: To determine diagnostic accuracy and safety of endoscopic biopsy and to evaluate the effectiveness of simultaneous endoscopic procedures in controlling concomitant hydrocephalus.

Design: Retrospective case note review of all endoscopic biopsies in a single institution from 1987 to September 2007. 134 consecutive patients undergoing endoscopic biopsy of intra- or periventricular lesions.

Outcome measures: Definitive pathological diagnosis; complications; requirement for ventriculoperitoneal (VP) shunt(s).

Results: Forty-five children and 89 adults underwent endoscopic biopsy; mean follow-up was 56 (2 - 218) months. 95 lesions were neoplastic and 39 were related to benign cystic, inflammatory or infective processes. A specimen could not be obtained in 2 patients. Definitive diagnosis was obtained on endoscopic biopsy alone in 73%. For tumours, endoscopic biopsy was diagnostic in 77%. Three astrocytomas could not be graded. There was no significant difference in diagnostic yield between rigid and flexible endoscopes (77% and 73% respectively, $p = 0.7$). There was no procedure related mortality. Two patients developed a postoperative haematoma requiring evacuation; another developed a transient neurological deficit after biopsy of a pineal tumour. In patients also undergoing endoscopic third ventriculostomy (ETV), 19% subsequently required insertion of a VP shunt and 13% revisional ETV during the follow-up period. None of the patients undergoing septostomy required bilateral shunts.

Conclusions: Endoscopic biopsy is a safe technique with a good diagnostic yield. An opportunity to treat concomitant hydrocephalus is also afforded.

T4-06: Efficacy of Ventricular Access Devices in the treatment of Neonatal Intraventricular Haemorrhage

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Objective: Post Haemorrhagic Hydrocephalus (PHH) secondary to Neonatal Intraventricular Haemorrhage (NIVH) is the commonest cause of infantile hydrocephalus. The presence of ventricular blood, underdeveloped immune systems and thin friable skin preclude shunting as a primary intervention. The role and efficacy of ventricular access devices (VADs) remains to be elucidated. The aim of the study is to determine the use of VADs and their effectiveness at treating NIVH.

Design: 32 Neonates were identified from the Neurosurgical Database from 1999 to 2006 who had undergone VAD insertion for NIVH. A retrospective review of the notes was undertaken.

Results: Wound breakdown 21%, infection rate 17%. The risk of complication was not associated with gestational age, birth weight or age at insertion. 58% of the neonates required VP shunts. The likelihood of shunting was associated with birth weight (<1 kg 71%, >1 kg 45%) and also gestational age (<27 weeks 74%, >27 weeks 40%). Four groups were distinguished by the use of the VAD: A: 0-1 ventricular taps & not shunted (21% of study group); B: 0-1 taps & shunted (17%); C: >1 tap & not shunted (21%) and lastly D: >1 tap & shunted (41%).

Conclusion: The VAD successfully distinguished the group of patients who did not require shunt insertion (group C) and facilitated neonatal maturation prior to shunt insertion (group D). Post insertion care is coordinated by the Neonatology team; this study highlights an apparent underutilisation of the VAD even in the presence of progressive PHH (groups A&B).

T4-07: Is Blood thicker than Water? Shunt blockage after Haemorrhage

S. J. Smith & R. D. Ashpole (Queen's Medical Centre, Nottingham, UK)

Objective: After haemorrhage into the cerebrospinal fluid (CSF) spaces, hydrocephalus is a frequent complication. CSF diversion in the form of a ventriculoperitoneal (VP) shunt may be necessary. We examined whether inserting the shunt early whilst the red cell count in the CSF remains high or waiting until the red cell count falls appears a better strategy.
Design: We conducted a retrospective audit of all patients requiring VP shunt insertion for hydrocephalus occurring secondary to bleeding who were operated on in the years 2005 and 2006 in our unit. Case notes were analysed for patient demographics, whether the shunt failed within one year of insertion and whether an external ventricular drain (EVD) had previously been inserted. Statistical analysis was undertaken to assess whether there was any significant relationships between these variables. We also examined the literature for evidence regarding early versus late shunt insertion.
Results: 47 patients in total were included in the study, ranging in age from 0 to 86. Intra-operative CSF samples were sent for 45 of the subjects and the red and white cell counts established. We found a statistically significant relationship between CSF red cell count and the likelihood of a shunt surviving one year ($p = 0.0002$). We also found a significant relationship between CSF white cell count and one year shunt survival ($p = 0.005$). Patients who had an EVD inserted prior to shunting were significantly older ($p = 0.0173$ T-Test).
Conclusions: Ventriculoperitoneal shunts inserted whilst the CSF red cell count remains high are significantly more likely to fail within one year, however delay until the white cell count rises is also associated with shunt failure.

T4-08: Diagnostic radiation endured by children who have had a permanent cerebro-spinal fluid (CSF) diversionary procedure in a British Paediatric neurosurgical unit

S. Majumdar, K. J. George, S. Das, D. Ngoga & G. Solanki (Birmingham Childrens Hospital, Birmingham, UK)

Objective: Some children who have had permanent CSF diversionary procedures undergo frequent head CT examinations during their childhood, resulting in potentially high, yet still unknown, accumulated radiation doses.Our objective was to evaluate the number of CT scans and shunt series done on children who undergo a permanent CSF diversionary procedure and calculate the radiation exposure.
Methods: A list of all patients who had permanent CSF diversionary procedure in a paediatric neurosurgical unit over a period of 5 years was compiled. The number of CT scans and shunt series performed on each patient was tabulated and analysed.
Results: 427 patients were admitted for a shunt procedure over a 5 year period. A total of 928 procedures were performed on them. These included 7 VA shunts, 22 endoscopic third ventriculostomies, 13 lumboperitoneal shunts. The rest were VP shunts. 164 patients had only one procedure. These patients had an average of two CT scans over the 5 year period. For those patients who had revisions, an average of 1.6 CT scan was performed for each revision. In addition to this they had an average of 3.25 shunt series xrays. However a few children had many more CT scans, including one child who had 31 CT scans in a 8 month period. The equivalent radiation dosage is discussed.
Conclusions: Significant amount of diagnostic radiation is endured by children who have had a permanent CSF diversionary procedure. Children who end up having frequent shunt revisions should have either MRI scanning or low dose CT protocols for scanning.

T4-09: The role of lumboperitoneal shunts in the management of syringomyelia

C. Oluigbo, K. Thacker & G. Flint (The Queen Elizabeth Hospital, Birmingham, UK)

Objective: The role of thecoperitoneal shunts in the management of syringomyelia remains undefined. The rationale for the use of thecoperitoneal shunt is the normalisation of CSF hydrodynamics thus preventing syrinx progression. In this study, we analyze the results of lumboperitoneal shunting procedures for syringomyelia performed in our institution.
Design: The medical records and radiological findings of 24 patients who had undergone lumboperitoneal shunting procedures for syringomyelia were reviewed. Data extracted included age, sex, underlying aetiology, as well as clinical and radiological outcome of the shunting procedure. Outcome Measures: clinical and/or radiological improvement.
Results: 24 patients underwent lumboperitoneal shunting procedures for syringomyelia in our institution. The mean age was 48 years (range, 24 years to 73 years). There were 17 males and 7 females. Underlying cause of syringomyelia was hindbrain (Chiari) herniation in 6 patients, post-traumatic

spinal arachnoiditis in 5 patients, post-meningitic spinal arachnoiditis in 1 patient, post Myodil myelogram arachnoiditis in 1 patient and intramedullary spinal haemangioblastomas in 2 patients. 6 patients had idiopathic aetiology. All patients with hindbrain hernias had previously undergone suboccipital decompression. The mean duration of follow-up was 21 months (range, 3 months to 51 months). Two patients were lost to follow up. Of the remaining 22 patients, 8 patients (36%) reported clinical improvement in their pre-operative clinical symptoms. Half of the patients with syringomyelia related to hindbrain herniation improved following shunting.
Conclusion: The use of lumboperitoneal shunts in the treatment of syringomyelia is an interesting concept based on a rational hypothesis. The was a clinical response in 8 out of 22 patients who had undergone this procedure in our series. The challenge will be in defining those patients who will most benefit from this procedure.

T6-01: Study on effects of L-Dopa pre-load on uptake of boronphenilalanine (BPA) in a model of murine glioblastoma

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Introduction: Boron Neutron Capture Therapy (BNCT) is an experimental binary radiation therapy used to treat malignant brain tumours. It exploits the different uptake of a Boron-10 (B^{10}) compound in healthy and tumour tissue and the high thermal neutron (nth) capture cross-section of B^{10}. The nuclear reaction that occurs when B^{10} captures a thermal neutron yields alpha particles and recoiling Li^7 nuclei, both with high linear energy transfer (LET) and short spatial range ($\sim$5-9 μm) comparable with the cell diameter. Therefore, the dose delivered is confined to the cell in which the B^{10} is located, leaving adjacent normal cells largely unaffected.
Objective: The aim of our work was to increase the tumour uptake of boronophenylalanine (BPA), a boron carrier used for glioma treatment.
Design: We have investigated the brain and tumour concentration of BPA in a group of rats (n = 30) pre-loaded with an infusion of L-dopa. The results were compared with those of a control group. Subjects: C6 glioma cells were implanted into the brain of male Wistar rats via a burr hole. Outcome measures: mean concentrations of the BPA in tumour and brain tissue by means of HPLC.
Results: The concentration of BPA in the rats pre-loaded with L-DOPA was the following: tumour 88.3 mg/gr (s.d. 12.1), ipsilateral brain 10.5 mg/gr (s.d. 6.2) and controlateral brain 6.6 mg/gr (s.d. 2.8). The concentrations in the control group were respectively: 33.5 mg/gr (s.d. 7.5), 12.0 mg/gr (s.d.6.2) and 7.4 mg/gr (s.d. 2.2).
Conclusion: This study demonstrates that pre-loading with L-dopa increases 3 to 4 times the tumour concentration of BPA in a murine model of glioblastoma. The healthy brain is not affected by L-dopa pre-loading.

T6-02: Persisting HSV1716 Induced Viral Oncolysis in Directly Injected Human Recurrent Glioblastoma

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Objective: Herpes Simplex mutantHSV 1716 whic^{2}h has a single deletion of the neurovirulence gene (ICP 34.5) has been shown to be an effective oncolytic agent in a wide range of tumours in vitro and in animal tumour studies. Safety issues related to the use of this virus in Humans by direct intracranial injection have accumulated in three studies in over 40 patients with high grade glial tumours. Effective treatment will depend on demonstrating sustained viral oncolysis in tumour patients.
Method: A patient with recurrent GBM was treated on three occasions at six week intervals with intratumoural injection with HSV1716. Biopsy samples were analysed before the injections and at each subsequent procedure for histopathology, HSV immunostaining, HSV-PCR and CD3,4,and 8 levels and compared with imaging.
Results: Histopathology, HSV immunostaining and PCR confirmed delayed persisting oncolytic tumour destruction in the tumour inconjunction with imaging changes.
Conclusion: These results confirm that there has been effective delivery of the virus to the lesion using the injection technique. Secondly, we are able to confirm that viral replication is indeed occurring by virtue of the increased and persisting HSV expression. The third issue is that the HSV expression load is increased at six weeks after the first injection indicating a prolonged and amplified replicative viral effect. The fourth issue is that at operation the findings indicate that tumour lysis is actually occurring in the area in which the virus injection has occurred.This promising early evidence of active oncolysis points the way to overcoming the translational issues influencing the effectiveness of these agents.

T6-03: Relationship between apparent diffusion coefficient and quantitative assessment of cellularity in oligodendroglial tumours characterised by genotype

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Objective: The apparent diffusion coefficient (ADC) describes microscopic water diffusion within tissues. Previous studies have reported a negative linear correlation between minimum ADC and tumour cellularity in gliomas, but there are no studies in oligodendroglial tumours. The aim of this study was to evaluate the relationship between ADC and tumour cellularity, and between tumour cellularity and histopathology or genotype in oligodendroglial tumours.
Materials and Methods: 17 patients diagnosed using serial stereotactic biopsy were studied (median 6 biopsies/case, range 3-8). Image analysis of haematoxylin and eosin stained sections was used to determine the cellularity of each biopsy and the minimum, maximum and mean cell density per case established. Post-processing (Functool2) generated ADC maps and regions of interest were placed to calculate minimum, maximum and mean tumour ADC.
Results: 1p/19q loss was present in 2/3 OII, 5/9 OAII, 2/5 OAIII. Grade III tumours had a higher maximum cell density than grade II (Mann Whitney; $P = 0.020$), while oligoastrocytomas had lower minimum cell density than oligodendrogliomas (Mann Whitney; $P = 0.032$). Tumours with and without 1p/19q loss had similar cell densities. There was no correlation between mean ADC and mean cell density (Spearman's rho; $r = 0.486$: $P = 0.438$), minimum ADC and maximum cell density (Spearman's rho; $r = 0.158$: $P = 0.660$), and maximum ADC and minimum cell density (Spearman's rho; $r = 0.039$: $P = 0.985$).
Conclusions: In this study, no relationship between quantitative assessment of cellularity and ADC was observed. This may reflect differences in oligodendroglial tumour biology compared to gliomas, although the composition of the extracellular matrix may influence ADC more than cellularity.

T6-04: The distinguishing of paediatric brain tumours using MR apparent diffusion coefficient parameters

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Objective: Non-invasive diagnosis of paediatric CNS lesions is often not possible, necessitating invasive biopsy. Diffusion MR techniques allow further characterisation of such lesions. Apparent Diffusion Coefficient (ADC) parameters were used to answer specific questions, the type of paediatric posterior fossa tumours and also to discriminate between PNET-MB and ATRT a particular diagnostic difficulty.
Design: Data was collected retrospectively and prospectively as part of pre-operative clinical imaging. Regions of interest were drawn manually on a T2 image to include the tumour and mapped to the ADC image. Off-line analysis produced ADC histograms for each case from which parameters including mean ADC, median ADC, peak height and centiles were extracted. Tumours were grouped histologically, two separate linear discriminant analyses were performed (SPSS v14) for posterior fossa tumours (Astrocytoma, v ependymoma, v PNET-MB) and PNET-MB v ATRT. For each a cross-validated classification of the tumours was produced. Subjects: 56 patients, (23 females, 33 males) all with a histopathologically confirmed diagnosis collected between September 2003 and August 2007. The mean age was 6.1yrs, range 0.1 to 15.8 years.
Results: Posterior fossa tumours were well discriminated using this method. Correct identification occurred with, ependymomas 4/5 (80%), Astrocytomas 11/11 (100%) and PNET-MB's 14/16 (84%). The method also classified 16/22 (75%) PNET-MB correctly in 16/22 (75%) and ATRT's in 3/4 (75%) cases respectively.
Conclusions: Results show ADC parameters can be used to correctly identify common paediatric posterior fossa tumours in 91% of cross-validated cases. It also correctly predicts 73% of cases when comparing PNET-MB versus ATRT. This technique could potentially reduce the need for invasive biopsy.

T6-05: Surgical resectability of infant ependymoma in the first UKCCSG/SIOP study

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Objective: To evaluate the factors that influence 'second-look'surgery in those with residual disease following resection of intracranial ependymoma in the paediatric population.
Design: Case series comprising data from patients enrolled into the UKCCSG/SIOP study[1] looking at primary postoperative chemotherapy following resection of intracranial ependymoma under 3 yrs age was used. The imaging was reviewed (44 patients with incomplete resection, 45 with complete) on data collected from 19 centres in the UK, Ireland, Denmark and Holland. 4 independent assessors, each paediatric neurooncologists, evaluated location of residual disease, perceived chance of complete resection as well as risk of cranial nerve injury. This was compared with the pre-operative imaging in those who underwent successful complete resection.
Results: Those factors that predispose to less than total resection are discussed. This is compared to those patients that successfully underwent complete

resection at the time of initial surgery. The perceived risk factors and their influence on the actual course of treatment are presented.
Conclusions: The extent of surgical resection has already been shown to influence progression-free survival as well as overall survival. The decision to offer 'second look surgery' can be predicted on the basis of tumour location and perceived risks of surgery.

Reference

1 Grundy RG, Wilne SA, Weston CL, *et al*. Primary postoperative chemotherapy without radiotherapy for intracranial ependymoma in children: the UKCCSG/SIOP prospective study. *Lancet Oncology*. 2007;8(8):696–705.

T6-06: Beta human Chorionic Gonadotropin (&b.alpha;-hCG) expression in pituitary adenomas: Relationship to endocrine function and tumour recurrence

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Objectives: The B subunit of human Chorionic Gonadotropin (β-hCG) is a marker of malignancies. Recent studies have also reported its expression in pituitary adenomas, although its significance is unclear. We quantitatively investigated the expression of β-hCG in a large series of pituitary adenomas and explored its relationship to endocrine function and tumour aggressiveness as measured by tumour recurrence and Ki-67 expression.
Design: Retrospective immunohistochemical study. Subjects: One hundred and twenty three patients undergoing surgery for pituitary adenomas. Outcome measures: The clinical details and the expression of standard pituitary hormones, β-hCG and Ki-67 were quantitatively studied by immunohistochemistry.
Results: Based on the endocrine profile and immunohistochemistry, the pituitary adenomas were grouped into non functioning (NFPA; $N = 78$) and functioning pituitary adenomas ($N = 45$). The latter included, 20 Growth Hormone (GH), 12 Prolactin (PRL), 8 Adreno-corticotrophin hormone (ACTH) and 5 mixed GH-PRL-producing adenomas. Ninety three (76%) tumours were classified as primary and 30 (24%) tumours classified as recurrent adenomas. Immunohistochemically, 107 (87%) of pituitary adenomas expressed β-hCG. The degree of β-hCG expression was more apparent with NFPA (91%) than functioning pituitary adenomas (80%) ($p < 0.05$). β-hCG expression was similar between primary (86%) and recurrent pituitary adenomas (90%) and it was also not related to Ki-67 expression. However, Ki-67 expression was greater in recurrent (33%) than primary (11%) pituitary adenomas ($p < 0.01$).
Conclusions: Although, β-hCG is expressed in the majority of pituitary adenomas, more especially in NFPA, it is unrelated to the risk of tumour recurrence or cellular proliferation as measured by Ki-67. The high levels of β-hCG sub unit expression in pituitary adenomas may provide a target for specific β-hCG-directed tumour therapies in the future.

T6-07: Gamma Knife Radiosurgery as an adjunct in the management of refractory pituitary neoplasia

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Objective: To assess the usefulness of Gamma Knife Radiosurgery in the management of pituitary adenomas.
Design: A retrospective study of cases of adenomas referred for GKS not cured by convential means; outcome measures being post-operative imaging and endocrine function.
Results: 29 patients identified with pituitary adenomas not cured by conventional therapy; these included 15 acromegalics, 5 patients with Cushing's syndrome, one of which had developed Nelson's syndrome, 1 prolactinoma, 1 TSH secreting adenoma (TSHoma), and 7 non-functioning adenomas. The acromegalics were all heavily pre-treated, without achieving biochemical remission. Mean time from diagnosis and first treatment to GKS in this group was 10.5 years, and the subset which had received previous conventional radiotherapy had done so a mean of 15.6 years previously. 46% of these patients have now achieved normalisation of their Growth hormone levels, and 73% have achieved reduction of IGF-1 levels to within the age related reference range. Of the 5 Cushing's patients, 2 achieved improved biochemical control. The other 3 had extremely aggressive tumours with Nelson's syndrome 85% of the NFPA patients showed disease stabilisation or tumour shrinkage, although 1 patient showed disease shrinkage at 2 years with regrowth requiring further surgery at 3.5 years. The patient with a prolactinoma showed a dramatic response: 75% reduction in prolactin level at 2 years and the TSH data is awaited. There have been no significant complications.
Conclusions: These data indicate that GKS is a highly effective and extremely safe adjunctive treatment for patients not cured with surgery and conventional radiotherapy. The data also indicate that GKS is a safe alternative to conventional radiotherapy in biochemically mild and anatomically well defined disease.

T6-08: Choroid Plexus Tumours - A 40 Year Experience from a Children's Tumour Registry

B. R. Chaudhary, P. Leach, A. Kelsey & I. D. Kamaly-Asl (Royal Manchester Children's Hospital, Manchester, UK)

Objective: Choroid plexus tumours are rare childhood neoplasms. Most reported series look at small number of patients within a confined period of time. We present the characteristics, survival and risk factors of choroid plexus tumours.
Design: Cases were identified from our local Cancer UK Childhood Tumour Registry. Prospective registry data together with retrospective case note review was undertaken. Subjects: All patients identified in the registry with histologically confirmed choroid plexus tumours from January 1956 to May 2007 were included in the study. Outcome Measures: Patient presentation, tumour characteristics and treatments were studied. Means were analysed using one-way ANOVA. Survival was analysed using Kaplan-Meier plots with log rank statistic.
Results: There were 58 patients; 30 Carcinomas and 28 Papillomas. Mean age at presentation was younger in the Carcinoma group; 1.9 vs 4.4 years (ANOVA $F = 5.948$, $p = 0.018$). Histological subtype was the most significant risk factor with mean survival of 26.1 (SE 3.8) years for papillomas and 2.4 (SE 0.9) years for carcinomas (log rank $p < 0.00001$). In the cases where extent of surgery was confirmed, gross total resection improved mean survival to 7.8 (SE 0.9) years from 1.9 (SE 1.09) years with subtotal (log rank $p = 0.0022$). Mean survival for the under 3 year olds was 9.0 (SE 3.5) years compared to 19.0 (SE 3.8) years for older children (log rank $p = 0.07$).
Conclusions: Choroid plexus tumours are rare childhood neoplasms with a particularly poor prognosis for the carcinoma subtype. Other risk factors for poor survival are subtotal surgical resection and young age at presentation.

T6-09: Neoadjuvant chemotherapy reduces operative haemorrhage and improves resection for Choroid Plexus Carcinomas

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Objective: Choroid Plexus Carcinomas (CPC) are rare malignant vascular epithelial tumours. They often present in the first year of life and this together with their vascularity makes them surgically difficult tumours. Gross total resection (GTR) has been associated with a better outcome. We aim to demonstrate if neoadjuvant chemotherapy for CPC reduces operative haemorrhage and facilitates surgical resection.
Design: Patients presenting to our unit with CPC between 1985 and 2004 were retrospectively investigated. Pre and post-operative tumour volume was calculated using a three dimensional method. Operative haemorrhage in relation to estimated blood volume (EBV) was determined using a standard formula. Comparison of means and survival were undertaken using t tests and Kaplan-Meier plots with the log rank test respectively. Multivariable linear regression analysis was used to identify the relationship between blood loss and potential predictive variables.
Results: Of 16 patients presenting with CPC eight were treated with neoadjuvant chemotherapy. Mean blood loss was reduced from 111% to 22% of EBV in the neoadjuvant group ($p = 0.02$). Mean debulking of tumour was increased from 64.3% without chemotherapy to 97.3% with ($p = 0.01$). GTR was achieved in 7 out of 8 patients in the neoadjuvant group and 4 out of 8 without chemotherapy. Improved survival was found in patients with GTR ($p = 0.01$) and age at presentation > 1 ($p = 0.02$). Linear regression analysis showed that pre-operative chemotherapy was the most significant factor determining operative blood loss.
Conclusions: Neoadjuvant chemotherapy significantly reduces operative blood loss and increases the extent of resection of tumour in patients with choroid plexus carcinoma.

T6-10: A single institution experience of atypical meningioma 2002–2007

S. R. Clark, J. Farah, M. K. Lee, M. S. Javadpour & P. R. Eldridge (Walton Centre for Neurology and Neurosurgery, Liverpool, UK)

Objective: To examine the current management of atypical meningiomas.
Design: A retrospective analysis of all atypical meningiomas operated in our unit, examining the effect of Simpson grading and adjuvant therapy. Subjects All adults undergoing craniotomy for meningioma from 2002–2007 with confirmation of atypical histology. Outcome measures: Number of re-operations, effect of adjuvant therapy, time to recurrence, post operative complications and performance status.
Results: There were 49 patients diagnosed with atypical meningioma (23 male, average age 55 yrs, range 32–75). The commonest presenting features were unilateral weakness (17/49), seizure (13/49) and headache (12/49). There was no significant difference between performance status pre and post op. Tumours commonly occurred on the convexity (22/49) or in parasagittal location (14/49). 15 patients received adjuvant radiotherapy (6 recurrence) whilst

34 received no radiotherapy (11 recurrence). The median overall disease free survival was 21 months (range 0–72). Of the 17 who recurred, 11 received surgery and radiotherapy, 4 surgery alone and 2 had no treatment. There were 19 complications in 15 patients including 1 death, 6 neurological deficits and 7 infections. Although numbers were small, there was no statistical difference in recurrence rates between Simpson 1 and 2 resections (38% vs. 31%) whilst Simpson 3 had a higher recurrence rate of 67%.
Conclusions: Atypical meningiomas are uncommon and their recurrence rate is high in our series (17/49 patients). This data suggests radiotherapy may need to be considered for all atypical meningiomas even after Simpson grade 1 resection.

T6-11: Day-case neurosurgery for brain tumours

P. L. Grundy (Wessex Neurological Centre, Southampton, UK)

Objective: To determine the safety and feasibility of day-case neurosurgery for brain tumours in an NHS hospital.
Design: Selected patients with intrinsic brain tumours treated from October 2006–November 2007 were prospectively allocated to day-case surgery. Day-cases were discharged 6 hours post-operatively.
Results: 50 patients were selected for day surgery and 38 underwent image-guided biopsy and 12 craniotomy for tumour resection. All but 2 of the craniotomy patients had surgery under local anaesthesia with sedation. 35/38 biopsy and 10/12 craniotomy cases were successfully discharged 6 hours post-op. One biopsy patient was admitted post-op with increased headache and 1 craniotomy case was admitted due to transient increased leg weakness. The other 3 overnight admissions were for patient preference. One biopsy patient was re-admitted 30 hours after discharge with a seizure and discharged the following day. No patients suffered an adverse outcome.
Conclusion: Day-case surgery for brain tumours is a feasible option in the NHS and is cost-effective, efficient and well-tolerated by patients. Results of this and other studies support the safety of the day-case concept.

T6-12: Results of Fractionated Stereotactic Radiotherapy for Patients with Vestibular Schwannoma

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Objective: To assess the use of fractionated stereotactic radiotherapy (FSR) in vestibular schwannoma.
Design: Between 1994 and 2006, 128 patients and a total of 135 VS were treated with FSR at the Royal Free Hospital. The median follow up is 48 months (range 12-96). Patients were treated with a relocatable frame to a total dose (TD) of 52.2 Gy in 25# (fractions), 50 Gy/25# in 6 patients. Planning was done using X knife software for all patients, and from August 2001 also with MRI fusion.
Results: 118 patients were enrolled in this study, 2/118 (1.7%) had increased significantly in size post therapy and were planned for surgery. 17/118 (14.4%) had minimal increases (2–3 mm), 82/118 (69.5%) were unchanged and 17/118 (14.4%) decreased in size. The local control rate was 98.3%. 2 patients had worsening of their facial palsy. 2 patients reported V nerve toxicity, and 2 others with pre-existing V nerve symptoms had resolution of their symptoms. There was a tendency to reduced hearing in the treated ear over time.
Conclusions: Fractionated stereotactic radiotherapy is very effective in treating VS in terms of excellent local control and low morbidity.

Friday, 11 April 2008

F2-01: Brain - body temperature gradient - does intracranial sensor type make the difference

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Objective: Brain temperature (Tbr) rises above body temperature (Tb) after traumatic brain injury (TBI) suggesting Tb measurements underestimate Tbr by an average of 1 degree C[1]. We have been unable to reproduce these results, finding small average differences between Tbr and Tb after severe TBI[2].

The aim of the study was to determine if Tbr-Tb differences reported in our original series, using Tbr sensor(A) is reproducible using a different Tbr sensor(B).
Design: Patients with severe TBI (GCS = 8) receiving dual intraparenchymal temperature/pressure monitoring were recruited on admission to ICU. Measurements of Tbr via sensor A (Integra Neurosciences, Andover, UK) and sensor B (Raumedic AG; Eden Medical, UK) were compared with Tb (via rectum, Tr).
Results: Sensor A: 37 patients aged 18–70 y, studied for 16–257 h (median 91h) Sensor B: 40 patients aged 16 to 75 y studied for 16–252 h (median 52 h) The group mean (CI) Tbr-Tr difference was −0.07 (−0.19 to 0.05) C with sensor A and 0.10 (0.02 to 0.18) C with Sensor B. Readings from sensor B produced significantly more positive Tbr-Tr differences compared with sensor type A (Chi^2 p = 0.02).

Conclusions: Data obtained using sensor B confirms our previous findings. After severe TBI the average difference between Tbr and Tb is small; temperature differences are independent of sensor type. Although sensor type may influence the direction of difference it is too small to be clinically significant.

References

1 Rumana CS, *et al.* Brain temperature exceeds systemic temperature in head-injured patients. *Crit Care Med* 1998;26:562–7.
2 Childs C, *et al.* Differences between brain and rectal temperatures during routine critical care of patients with severe traumatic brain injury. *Anaesthesia* 2005;60:759–65.

F2-02: Treatment of chronic subdural haematomas: a retrospective comparison of craniectomy and burrhole drainage

M. A. White, C. Mathieson, E. Campbell & K. W. Lindsay (Southern General Hospital, Glasgow, UK)

Objective: Chronic subdural haematomas are amongst the most common conditions encountered by neurosurgeons. Various surgical procedures have been described, including twist drill craniostomy, single or multiple burrhole drainage with or without subdural drain, craniotomy and craniectomy. A recent metanalysis demonstrated that burrhole drainage has less complications when compared to craniotomy and is more effective than twist drill craniostomy. The optimal method of treatment remains unknown.

The aim of the study was to determine the proportion of patients requiring repeat operative drainage or Dandy cannula aspiration following initial surgery (either craniectomy or burrhole drainage) to evacuate a chronic subdural haematoma.
Methods: A retrospective case note review was performed of all patients with a primary chronic subdural haematomas treated between 1st January 2003 and 31st December 2005 at this institute. The decision to treat by craniectomy or burrhole drainage was made by the responsible consultant. Information was recorded regarding the patient's pre-operative clinical condition, use of anticoagulants, coagulopathy, history of alcohol abuse and the CT appearance of the haematoma. The primary end point was a symptomatic recurrence, requiring either aspiration or reoperation. In addition the clinical outcome, prior to discharge and at three months was recorded.
Results: Of 247 patients with a primary chronic subdural haematoma included, 131 underwent burrhole evacuation, 116 underwent a craniectomy. 23 patients in each treatment group developed a symptomatic recurrence, requiring further treatment. 21 patients (16.0%) required a reoperation following burrhole evacuation compared to 15 patients (12.9%) following craniectomy.
Conclusions: Craniectomy is as effective at treating chronic subdural haematoma as burrhole drainage. It has the advantage of facilitating aspiration of a recurrent haematoma without the need for a further anaesthetic, which can be hazardous in this group of patients. A randomised controlled trial would validate this conclusion.

F2-03: 48-Hour Working Week - The Impact on Elective Neurosurgical Exposure

N. J. Johnston, D. T. Holsgrove & I. D. Kamaly-Asl (Hope Hospital, Manchester, UK)

Objective: To compare the elective neurosurgical theatre exposure of a junior and senior registrar employed in a new 48-hour shift rota with a previously worked hybrid 56-hour rota.
Design: The daily rotas of a junior and senior neurosurgical registrar were analysed during two, one-year periods (August 2006–July 2007 and August 2007–July 2008). During the first period of analysis the registrars were working a hybrid 56-hour rota and during the second period a 48-hour shift rota. The number of elective theatre sessions assigned to each registrar was calculated. The sessions for 2006 and 2007 included annual leave and those for 2008 were adjusted to include maximum annual leave allocation. Outcome Measures - The number of elective theatre sessions assigned to a junior and senior registrar in the two analysed time periods.
Results: The number of elective theatre sessions allocated to the senior and junior registrar during the one-year period working a hybrid 56-hour rota was 130 and 122, respectively. The number of elective theatre sessions allocated to the senior and junior registrar during the one-year period working a 48-hour shift rota was 135 and 133, respectively.
Conclusion: The European Working Time Directive timetable states that working hours will be reduced to 48 hours per week for all employees in August 2009. This has led to concerns that this will result in reduced surgical exposure. Our unit has devised a 48-hour compliant rota, which has ensured that there has been no reduction in elective theatre sessions allocated to junior and senior registrars.

F2-04: MTAS did not discriminate between the surgical skills of applicants

I. D. Kamaly-Asl & H. C. Patel (Hope Hospital, Manchester, UK)

Objective: Our Neurosurgery Specialty Training Committee was concerned that the MTAS process would not deliver on its claims for selection particularly with regard to the evaluation of technical abilities. Therefore, to aid in future selections we

decided to undertake a service evaluation of the 2007 selection process to identify if it was fit for purpose, specifically with regards to assessment of technical skills.

Design: The applicants for all years (ST1 to 4) of neurosurgical specialty training in our Deanery were evaluated for surgical skills using a skin suturing Objective Structured Assessment of Technical Skills following their interviews. The scores of the elements of the MTAS application testing technical skills together with overall shortlisting and interview scores and experience of the candidates were correlated with the skills assessment scores. Multivariable linear regression analysis was used to identify the relationship between the independent variables and surgical technical skills.

Results: There were 40 applicants interviewed in total (ST1, 8: ST2, 10: ST3, 12: ST4, 10). There was no difference in surgical skills between the round 1a and round 1b candidates ($p = 0.658$). None of the elements from the MTAS application were predictive of surgical technical ability ($p = 0.869$). There was correlation of technical ability with year of application (ST1 to 4) and parts of the MRCS exam completed (Parts 1 and 2 written, vivas and clinicals) ($p < 0.00001$).

Conclusions: The MTAS selection process was unsuccessful in identifying the surgical skills of candidates. Further close follow up of this year's successful candidates into surgical run through training must be undertaken to inform and guide future selection procedures.

F2-05: Accuracy of surgical coding errors in Neurosurgery

S. M. Thennakon, S. Bavetta & H. L. Low (Queen's Hospital, Romford, UK)

Objective: To assess the accuracy of surgical coding for neurosurgical procedures.

Design: A prospective study, collecting and analysing data from all patients receiving neurosurgical procedures from 16th August to 16th September 2007 in a single neurosurgical unit serving a catchment population of 2.5 million people. Subjects: 81 documented operations. Outcome measures: Number of incorrect clinical codes, the types of operation most likely to have coding errors and the estimated financial result resulting from such inaccuracies.

Results: 49/82 of all operations were incorrectly coded. Seventy-nine coding errors were identified with the majority being those of omission (64.6%) followed by operations that were wrongly labelled (14.6%). The majority of coding errors due to omission were those involving spinal procedures whereas complex intracranial surgical operations were most likely to be mis-labelled. The most common causes of coding errors were poor documentation in the operation notes and misunderstanding of the operative procedure by the coding clerks.

Conclusion: Surgical coding errors are common with the majority being due to procedures being left out. This has the effect of reducing the validity of records when used for research or audits and has financial implications. In a one month period approximately £10 000 was lost purely due to coding errors. We discuss the causes of errors and make suggestions on how to correct this.

F2-06: Audit of ''two week wait'' referrals for suspected brain and CNS cancer

D. Holliman & P.J. Kane (James Cook University Hospital, Middlesbrough, UK)

Objective: The National Institute for Clinical Excellence (NICE) published referral guidelines for suspected brain and CNS cancer in June 2005. These were developed by the Collaborating Centre for Primary Care (NCC-PC) and have provided the basis for which general practitioners have referred such patients under the ''two week wait'' rule.

The aim of the study was to assess the referral patterns and efficacy of these guidelines in making a new diagnosis of brain or CNS tumour.

Design: Retrospective review of case notes of patients referred under the ''two week wait'' rule between April 2006 and March 2007. Subjects: Notes of 69 patients were reviewed, 36 (52%) female, 33 (48%) male with a median age of 48 years (range 19–82 years).

Results: Only 3 (4%) of reviewed patients who were referred under ''two week wait'' rule resulted in a new diagnosis of CNS tumour. Six (8.5%) patients referred had a pre-existing diagnosis of CNS tumour usually as the result of GP scanning. The commonest diagnosis was headache/migraine in 30% ($n = 21$) of patients. Only 40 (58%) of patients appeared to have symptoms or signs for which referral would be recommended. Individual GPs referred up to 5 patients during the audit period.

Conclusions: The yield of new tumour diagnosis in patients referred under the ''two week wait'' rule is low. Thus NICE guidelines for the referral of suspected CNS tumours appear somewhat insensitive. This parallels findings in other areas of oncology. Guidance regarding referral patterns or revision of the guidelines may be needed.

F2-07: Audit of Paediatric Head Injury admissions to the Institute of Neurosciences, Southern General Hospital, Glasgow over the period 2001–06

G. D. McKenzie, S. Forsyth & J. St George (Southern General Hospital, Glasgow, UK)

Objective: This audit reviewed all paediatric head injury admissions (under 16) over the 5 year period (2001–2006). The aim was to examine trends: in the type of injury, and determine lengths of stay, the numbers requiring surgical intervention and outcomes.
Methods: A retrospective analysis of the admission database, maintained by the paediatric liaison nurse practitioner, was performed. Age at presentation, type of injury, length of stay, the referring health board, whether surgical intervention was required and discharge destination were recorded.
Results: 319 paediatric HI admissions were included. Over 70% of the cohort was male. There was a 20% reduction in admissions to the unit, during the period of study with notable decreases in the preschool age group (38% to 23%) and a rise in 12+ group, especially in the last 2 years. The majority of HI occurred during summer months. Uncomplicated skull fracture was the most common diagnosis followed by extradural haemorrhage. The average length of stay fell from 7.6 to 5.2 days. An average of 25% of admissions required surgical intervention and approximately 88% of all admissions were discharged home.
Conclusion: Data compares favourably with previous audits. The number of paediatric admissions as well as those requiring surgery appears to be falling.

F2-08: Patient Satisfaction - How Perceptive are Neurosurgeons

C. Dick, D. Bell & H. Marsh (St.George's Hospital, London, UK)

Objective: Validated objective outcome assessment tools exist for a wide variety of neurosurgical conditions yet outside of the research setting they are not routinely used. Clinical practice is usually derived from a mixture of evidence based medicine modified by personal experience yet little has been written about correlation between doctors and patients perceptions of a good outcome.

The aim of the study was to assess the correlation between doctors and patients assessments of satisfaction with respect to outpatient consultations and surgical treatment.
Design: Prospective questionnaire survey scoring satisfaction with treatment of both patient and doctor following all consultations at the neurosurgical outpatient department over a 2 week period.
Results: 67 patients completed the assessment of whom 40 had undergone surgery. The mean satisfaction of patients undergoing spinal surgery at 6.9 was significantly lower than that of cranial patients 9.25 ($p < 0.005$). There was a poor correlation between doctors and patients assessment of satisfaction with both the outpatient consultation and their surgical treatment (Pearson coeff. $= -0.012$). Doctors consistently rated lower assessments of patient satisfaction than those reported by patients. There was no significant difference in the abililty of consultants versus registrars to predict patient satisfaction.
Conclusions: Most patients are happy with their outcome following surgical treatment, particularly those undergoing intracranial surgery. Surgeons tended to underestimate patients levels of satisfaction with their care.

F2-09: Review of the historical relationship between arts and neuroscience

F. Geranmayeh[1] & K. Ashkan[2] ([1]North West London Hospitals NHS Trust, London, UK and [2]Kings College Hospital, London, UK)

Objective: Art and Neuroscience often appear as two polarized worlds with little overlap.

The aim was to explore the complex relationship between art and neuroscience from neuroanatomical, neurological and neurosurgical perspectives.
Design: Review of significant ancient texts, artefacts, paintings and drawings.
Results: Historical knowledge of neuroanatomy can be delineated by study of ancient texts and drawings from Egyptian, Greek and Islamic periods, as well as works by Leonardo da Vinci and Michelangelo. There are numerous examples of paintings that have been created by an artist witnessing a neurological sign, often long before it is described in the scientific literature. Inspired by neurological phenomena and aided by a superior power of observation, artists including de Ribera, El Greco, Bruegel, Masaccio and Bosch have preserved neurological signs or neurosurgical procedures through detailed brush strokes. From the latter we have gained insight into the neurosurgical environment, techniques and reasoning prevalent at the time of the paintings. At other times the will for better understanding and teaching has pushed neuroscientists or neurosurgeons such as Harvey Cushing to document their own studies through drawing. Furthermore sometimes it is a work of art that is a confirmation of the presence of a neurological disease in its creator. More recently the concepts of cerebral localisation of creativity and talent, and neuro-aesthetics have attracted interest by the neuroscientists.
Conclusions: Throughout the ages, art and neuroscience have had a delicate yet definite relationship with reciprocal influence. Both disciplines have developed in parallel based on temperament and philosophical milieu of their time.

Prize winning abstracts from the 2008 meeting of The British Neurosurgical Research Group

F5-01: Neurotransmitter regulation of adult neural stem cells

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Objective: There is increasing evidence that neuronal activity regulates the generation of new neurons in the adult hippocampus, a phenomenon that appears important for certain forms of hippocampal learning and the maintenance of normal mood. Altered hippocampal neurogenesis after brain injury may explain cognitive and mood disorders seen in patients after head trauma. The mechanisms by which neuronal activity controls neurogenesis are largely unknown. We have previously shown that a peptide neurotransmitter (NPY) released by interneurons is proliferative for hippocampal stem cells. This study investigates how VIP, another peptide neurotransmitter, modulates hippocampal neurogenesis alone and in combination with other neurotransmitters.
Methods: We have investigated the effect of VIP alone and in conjunction with NPY in hippocampal neuronal cultures from postnatal rats (P7-9). Bromodeoxyuridine (BrdU) and Ki-67 were used to measure cell proliferation. Quantification of cell death was achieved using DAPI and propidium iodide (PI). Immunohistochemistry was used to determine cell-specific phenotypes. PCR assay was carried out to study the expression of VIP receptors. In-vivo studies were performed in germ-line VPAC2 knockout mice.
Results: Using Immunohistochemistry and PCR techniques, we have demonstrated the expression of VIP receptors and their mRNAs by hippocampal cells. We have also shown that VIP at nanomolar concentrations is trophic to hippocampal progenitor cells and their progeny. Our data suggest that the effect is mainly through enhancement of symmetrical cell division. Pharmacologically, our results indicate that VIP effects are mediated by the VPAC2 receptor. We confirm the effect of VIP in-vivo, by demonstrating significantly reduced survival of newly born neurons in germline VPAC2 receptor knockout mice. Interestingly, when cells were exposed to VIP in conjunction with NPY, VIP abolished the NPY-proliferative effect, but enhanced neurogenesis.
Conclusions: We conclude that VIP by itself and through interaction with NPY is an important trophic factor for hippocampal neurogenesis. We suggest that these neuropeptides provide a novel control system for hippocampal neurogenesis depending on their differential release. This control system may provide therapeutic targets for altered neurogenesis after brain injury.

F5-02: Hyperosmolarity induced by 23.5% hypertonic saline therapy is associated with stimulation of hypothalamus-pituitary axis in patients with poor-grade aneurysmal subarachnoid haemorrhage

M. Y. Tseng, P. J. Hutchinson & P. J. Kirkpatrick (Addenbrooke's Hospital, Cambridge, UK)

Objective: Integrity of the hypothalamus-pituitary axis is associated with favourable long-term outcome after aneurysmal subarachnoid haemorrhage (aSAH). However, tests of the integrity of the axis by osmotic stimulation in these patients have not been reported.
Methods: Thirty-five poor-grade aSAH patients received intravenous infusions of 23.5% hypertonic saline, 2 mL/Kg. Full blood cell counts, coagulation profiles, and serum biochemistry were checked before, at one hour and then every 6 hours, for a total of 24 hours, after the infusion. Serum levels of adrenocortical tropic hormone (ACTH) and cortisol were checked before and at 1, 6 and 24 hours after the infusion. Intravenous physiological saline (0.9%) was given to keep the maximum rate of reduction in serum sodium < 10 mmol/L per day in order to avoid potential central pontine myelinolysis.
Results: The average interval between aSAH and the treatment episodes was 4.6 ± 3.2 days. Among the 15 patients who had baseline cortisol samples, 5 had levels below normal (33.33%). Among these 15 patients, 13 of them had baseline ACTH samples and 4 of them had levels below normal (30.77%). Changes in serum cortisol were not significant, but there were trends in increasing serum ACTH at 1 (+56.59%, $p = 0.151$) and 6 hours (+165.38%, $p = 0.101$) after the infusion, which correlated with serum osmolarity (at 24 hour, $r = 0.782$, $p = 0.008$). Favourable outcome at discharge measured with modified Rankin Scale (1–3) seemed to be associated with a higher cortisol level before the infusion ($p = 0.093$) and higher serum osmolarity at 24 hours ($p = 0.130$).
Conclusions: It seemed that a significant proportion of poor-grade aSAH patients had subnormal adrenal function during the acute phase. Hyperosmolarity induced by hypertonic saline therapy appeared to be able to stimulate the hypothalamus-pituitary axis in patients with poor-grade aSAH. The association between a higher cortisol level before the hypertonic saline therapy and a favorable outcome at discharge implies that additional supplement of hydrocortisone may have positive effects on osmotherapy or may be able to compensate the abnormal hypothalamus-pituitary-adrenal axis.

F5-03: The relationship between cortical blood flow and spreading depolarisations in brain injured patients as measured with laser Doppler flowmetry and electrocorticography

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Objective: Two patterns of transient depression of electrocortical activity spreading across the penumbral cortex in patients with acute brain injury have been reliably detected in both animal & human studies. Peri-Infarct Depolarizations (PIDs) propagate at a similar speed to Cortical Spreading Depression (CSD), 3–5 mm/min, and have been associated with increases in infarct volume[1]. The characteristics that can be used to differentiate CSDs from the more harmful PIDs are currently under investigation and can be assessed by their electrical or vascular signatures. The relationship between PIDs and loss of perfusion has been shown in cats to cause secondary deterioration in the penumbra by propagation of ischaemia[2].
Methods: In the following case studies, the dynamic electrophysiological environment in the penumbra of a series of brain injured patients was monitored using electrocorticography (ECoG) and laser Doppler flowmetry (LDF). A six contact subdural electrode strip with four laser Doppler fiber optic probes built into the strip at 1 cm intervals was placed at craniotomy onto the penumbral cortical surface. Intracranial pressure (ICP) and microdialysis (MD) probes were also placed into the same region of cortex. Monitoring continued for 3–5 days on the intensive care unit before the probes were removed.
Results: In all cases, slow potential (DC) changes, characteristic of spreading depolarisations (SDs-incorporating CSD & PID) were seen. Cortical blood flow changes during these events were measured by LDF. Throughout these recordings, spreading depolarizations were accompanied by marked changes in LDF. The precise vascular response (hypo or hyperperfusion) to SDs varied depending on the relative severity of compromised cortical tissue. In each event, the cortical perfusion changes were always *preceded* by the SD seen on ECoG curve.
Conclusion: This 'coupling' between electrical event and vascular response appears to confirm the relevance of experimental evidence for spreading vasodilation or vasoconstriction in response to depolarisation.

Deterioration in the pattern of the perfusion response appears to run broadly in parallel with clinical deterioration.

If SDs, whether CSD or PID, cause damaging alterations in cerebral cortical perfusion, this could provide a therapeutic target in brain injury, either for inhibition of SDs or reversal of the vasoconstrictor effects.

References

1 Hartings JA, Rolli ML, Lu XC, Tortella FC. Delayed secondary phase of peri-infarct depolarizations after focal cerebral ischemia: relation to infarct growth and neuroprotection. *J Neurosci* 2003 Dec 17;23(37):11602–10.

2 Strong AJ, Anderson PJ, Watts HR, Virley GJ, Lloyd A, Irving EA, Nagafuji T, Ninomiya M, Nakamura H, Dunn AK, Graf R. Peri-infarct depolarizations lead to loss of perfusion in ischaemic gyrencephalic cerebral cortex. *Brain* 2007 Apr 130(4):995–1008.

F6-01: Can a novel, standardised neuropathic pain assessment tool be a reliable predictor of which patients have lumbar radiculopathy?

R. J. Mannion, J. Scholz, A. Phillips, D. Scoffings, R. J. Laing & C. J. Woolf (Addenbrookes Hospital, Cambridge, UK)

Objective: Neuropathic pain can be difficult to treat and regimens using atypical analgesics, regional anaesthesia and other adjuncts are often attempted by ''trial & error''. We have developed a clinical assessment tool called StEP (Standardised Evaluation of Pain) which reliably identifies those patients with neuropathic pain features over other chronic pain elements. We have applied this to neuropathic and non-neuropathic low back pain patients (i.e. with and without radiculopathy) to assess sensitivity and specificity.
Methods: An early and more extensive version of the clinical assessment tool (16 questions exploring a total of 46 pain-related items; physical exam with 23 tests providing information about 39 items; 1 hour) was used to assess 187 patients with painful diabetic neuropathy, post-herpetic neuralgia, neuropathic & non-neuropathic low back pain. From this, a short form version of the tool, StEP, was generated and applied to 155 patients attending for assessment/ treatment of low back pain (6 questions, 10 physical tests; 10 minutes).
Results: From data acquired with the long form version of StEP on 187 patients with neuropathic and non-neuropathic pain, we used hierarchical cluster analysis to show that patients were separated into distinct neuropathic and non-neuropathic groups. Moreover, distinct subtypes of neuropathic pain that are disease-independent were identified within the neuropathic pain group. When the short form version StEP was applied to 155 patients with low back pain, it was found to robustly discriminate between patients with neuropathic and non-neuropathic low back pain, using only a small number of clinical discriminators. We have correlated their StEP data with MRI findings and management.
Conclusions: StEP is a practical yet robust tool that strongly predicts which patients have neuropathic features and are therefore likely to (a) have positive MRI and (b) respond to surgical decompression of the nerve root. StEP would be a useful triage tool in primary care, and will shed more light on the heterogeneity of neuropathic pain in the wider population of patients.

F6-02: A pilot study to evaluate diffusion MRI and Proton MRS imaging in cervical spinal cord disease

E. T. Smith & T. J. D. Pigott (Walton Centre for Neurology and Neurosurgery, Liverpool, UK)

Objectives: To evaluate diffusion MRI and Proton MRS in the assessment of patients with suspected cervical cord disease.

Methods: 25 patients presenting with suspected cervical spinal cord disease had MR imaging (3T Philips Achieva) which included, in addition to routine T1 and T2 weighted sagittal and axial sequences, diffusion weighted imaging, diffusion tensor imaging, proton MRS of the spinal cord and CSF flow studies.
Results: 11/25 patients had areas of increased signal intensity on T2 weighted sagittal sections. 10/18 patients had an increase in Apparent Diffusion Coefficient (ADC) values in the cord lesions. (Not all patients had ADC measurements) 5 patients had increased signal in the cervical cord and increase in ADC values of lesion. 3 patients had increase in signal intensity in the cord and no increase in ADC value. It is proposed that, in the 5 patients with bright signal on T2W images and an increase in ADC, the "bright spot" is due to oedema rather than gliosis.
Conclusions: This study demonstrates that MR diffusion may be helpful in the differentiation between cord oedema and gliosis. Ongoing work will look at the clinical correlates. This could enable a better prediction of prognosis in pre-operative patients.

F6-03: Day case lumbar microdiscectomy: Is it a viable option in the UK?

K. K. Gnanalingham, A. H. Abou-Zeid & D. Jordan (Hope Hospital, Manchester, UK)

Objectives: The inpatient length of stay for lumbar discectomy has been steadily declining, since its original description over 70 yrs ago. The operation has also been described as a day case procedure by the late Huw Griffith in 1987[1]. We describe our present experience.
Design: A series of patients awaiting lumbar discectomy under one consultant were screened prospectively for suitability for day case surgery (ie discharge within 24 hrs). All patients were admitted on the day of surgery and underwent lumbar discectomy via a unilateral approach, with the aid of an operating microscope and a variety of muscle retractors. Clinical details were recorded and back and leg pain were assessed pre and post-operatively using the Visual Analogue Scale (VAS).
Results: Between 2005 and 2007, 44 out of a total 64 patients met the selection criteria for day case microdiscectomy. The mean age was 43 ± 13 yrs and 27 were males. The operated levels were unilateral in all but one case and were at L4/5 (46%), L5/S1 (46%) or both levels (8%). There were improvements in mean VAS scores for leg pain (8.7 ± 1 to 2.2 ± 3) and back pain (7.5 ± 3 to 2.2 ± 3) ($p < 0.05$), at a mean follow-up of 26 wks. Half of the patients went home on the day of surgery and the rest were discharged after an overnight stay and within 24 hrs of surgery. Majority (77%) of patients said that they would recommend the procedure again. A telephone survey of the 33 Neurosurgical units in the UK revealed that only 1 other unit offered lumbar discectomy as a planned day case procedure.
Conclusions: Lumbar microdiscectomy can be undertaken as a day case procedure, in carefully selected patients and using standard operative techniques. However, this service is not widely available in the UK at present. The possible reasons underlying this and the details of our protocols and surgical technique are discussed.

Reference

1 Griffith H, Marks C. Outpatient surgery for prolapsed lumbar disc. *Brit J Neurosurg* 1987;1:105–110.

F6-04: Improved outcome after lumbar microdiscectomy in patients shown their excised disc fragments: a prospective, double-blind, randomized, controlled trial

M. J. Tait, C. Pocock, J. Levy, M. Nollett, V. Petrik, B. A. Bell & M. C. Papadopoulos (St George's Hospital, London, UK)

Objective: To test the hypothesis that presenting the removed disc material to patients after lumbar microdiscectomy improves outcome.
Design: Treatment groups were allocated by simple randomization with prospective data collection. Patients were blinded as to the trial hypothesis and investigators were blinded to patient allocation. Patients in the experimental arm were given their removed disc fragments once they had recovered from anaesthesia.

All adult patients undergoing a planned single-level lumbar microdiscectomy for radiculopathy due to a prolapsed intervertebral disc over a six month period were considered for entry into the trial. 74 patients were recruited of which 36 were given their resected fragments. The groups were evenly matched by age, sex and symptomatology. There was one crossover. The primary outcome measures was the degree of improvement in sciatica and back pain reported by the patient at 2–4 months after surgery. Secondary outcome measures were the degree of improvement in leg power, paraesthesia, numbness, maximum walking distance and use of analgesia.
Results: Analysis was by intention to treat. Patients who were shown their disc postoperatively were more likely to report an improvement in their leg pain (94.4 vs. 80.5%; $p = 0.0475$) and back pain (86.1 vs. 75.0%; $p = 0.048$). No significant difference was found for the secondary outcomes except for greater improvement in motor deficit in the group shown the disc (90.5 vs. 56.3%, $P = 0.0078$).
Conclusions: Giving patients their removed disc fragments is a simple, non-invasive, cost effective measure which significantly improves the outcome of lumbar microdiscectomy.

F6-05: Cervical Spine Injuries: The Cambridge Experience

M. K. Teo, R. J. Mannion, N. Singh, J. Easton & R. J. C. Laing (Addenbrookes Hospital, Cambridge, UK)

Objective: Traumatic spinal injury most commonly affects the cervical spine. Here, we review our experience of patients with C-spine injury admitted to our service during the last four years when neurosurgery has taken on the large bulk of regional C-spine trauma.
Design: A retrospective study of 80 consecutive patients with traumatic cervical spine injury from Jan 2004 – March 2007 was performed. Preoperative assessment (demographic data, clinical, radiological features), management and outcome (symptoms, post-operative complications) were recorded for patients.
Results: 56 patients were male (70%) and 24 female (30%), with an age range of 6 to 91 years (mean 48 years). The majority of patients (52/80, 65%) had subaxial spine injury, while 24 patients (30%) had C1-C2 injury, and 4 patients (5%) had both upper and lower cervical spine injury. 39 patients (49%) had no neurological deficit, and 7 (9%) had complete cord injury (ASIA A). Of the 4 patients with both upper and lower cervical spine injury, 2 had complete cord injury, 1 had partial cord injury and 1 had no neurological deficit. The proportion of patients with neurological injury was significantly higher for those with subaxial injury (37/52, 70%) compared those with C1-C2 injury (1/24, 4%) ($p < 0.005$). Surgical fixation of C-spine injuries was performed in 32 patients (40%). The majority of these fixation (29/32, 91%) were on those with subaxial C-spine injury, with the majority fixed posteriorly (22/32, 69%). 6 patients had both anterior and posterior fixation for their subaxial C-spine injury. Up to 6 months follow up, over 70% of patients had no or minimal neck pain, and similar proportion had no neurological deficit. We will discuss management decision making, treatment failures and those patients who subsequently require escalated intervention ($n = 4$).
Conclusions: More and more spinal trauma is being managed by neurosurgery units over orthopaedic centres. We have experienced a learning curve with C-spine trauma management, especially over issues such as the use of flexion-extension views, patient follow up.

F6-06: Extramedullary Spinal Tumours: Quality of Life Following Surgical Resection

M. R. Guilfoyle, H. M. Seeley & R. J. Laing (Addenbrooke's Hospital, Cambridge, UK)

Objective: The majority of primary extrinsic spinal tumours are benign and the principal objective of surgery is to preserve function and if possible improve symptoms. However, quality of life measures have not typically been reported in previous series. The present study examined functional status following resection and factors influencing outcome.
Design: Prospective observational study conducted between 1998 and 2006. Patients were assessed prior to surgery and subsequently at 3 months and 12 – 60 months post-operatively. The SF-36 health survey was used to measure quality of life.
Results: Fifty-two patients underwent surgery - 23 had meningiomas (87% female; age 38 – 87, median 64) and 29 had schwannomas (31% female; age 15 – 73, median 54). Complications included four CSF leaks, two pseudomeningoceles, and one wound infection; there was no peri-operative mortality. Follow-up data were available in 50 patients of whom the majority reported symptomatic improvement to 3 months and beyond. At late follow-up, SF-36 Physical Function and Bodily Pain domain scores were better in 69% and 71% of patients, respectively, and the increases were significant in the schwannoma subgroup ($p < 0.01$, Wilcoxon Signed Ranks Test). In contrast, 17% of the patients'reported Physical Function persistently lower than baseline after surgery. Regression analysis showed pre-operative Physical Function was the significant predictor of outcome ($p < 0.05$).
Conclusion: Resection of extrinsic spinal tumours improves quality of life in the majority of patients and is associated with relatively low morbidity. Functional status at presentation is a strong predictor of quality of life outcome and this evidence should encourage early surgical intervention.

F6-07: Metastatic Extradural Spinal Cord Compression (MESCC) and the role of surgery. A retrospective review

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Objective: In 2005, Patchell suggested that aggressive surgery for malignant spinal cord compression (MSSC) has a greater role than previously thought. The true incidence of this patient subgroup within all patients treated with radiotherapy for metastatic spinal cord disease has not previously been determined.
Design: Retrospective case note review. Subjects: All patients treated by radiotherapy for malignant spinal cord disease at a single UK oncology unit over one year. Outcome Measures: Clinical presentation, radiological findings, primary tumor, treatment, clinical outcome and survival.
Results: 161 patients had radiotherapy in 2006. 158 case notes were available for examination. 17 patients (10.7%) fullfilled Patchell's criteria for surgical

intervention, but only 3 were recorded as being referred for a surgical opinion, and not one was accepted. A further 30 patients not fullfilling Patchell's criteria were referred for a surgical opinion, and five had surgery. A further 16 patients did not meet Patchell's criteria (7 unknown primary, 9 lumbosacral disease) but might have benefited from surgery.

Conclusions: Up to twenty percent of patients treated with radiotherapy for malignant spinal cord disease would benefit from surgical intervention. Currently, in the region studied, only 3% were treated with surgery. These figures allow neurosurgical and oncology units to predict patient numbers to help improve treatment in this patient group.