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PROCEEDINGS

Proceedings of the 2011 Autumn Meeting of the Society of British Neurological Surgeons

The meeting is being held in the Hilton Metropole Hotel, Brighton, 7–9th September 2011, and is hosted by Hurstwood Park Neurological Centre, Brighton, UK.

The abstracts of platform presentations are followed by the titles of those submissions accepted as posters.

These abstracts are published in advance of the meeting. If any papers are subsequently not read to the Society or are withdrawn, an addendum to this effect will be published in the next issue of the Journal.

WPM1-1: An analysis of surgical reanimation strategies in posttraumatic flaccid paralyses of the upper extremity

K. G. Krishnan (Hannover Medical School, Hannover, Germany)

Objectives: Flaccid palsies of existent extremities are debilitating aftermaths of civilian and battle injuries to the nervous system, that significantly reduce the quality of lives and professional productivity of patients. Consequently they pose an enormous burden on a given socio-economic system. Thus limb reanimation plays a central role in modern neuroscience research, especially in the present age of sophisticated possibilities in life and limb salvage, but at the same time an age of armed conflicts and high velocity accidents. This report will focus on our experiences with limb reanimation strategies.
Design: A retrospective analysis of function after primary reconstruction and limb reanimation in traumatic lesions of the brachial plexus and peripheral nerves.
Subjects: Between 1999 and 2010 we treated 351 adults for traumatic lesions of the peripheral nerves (PN) and brachial plexus (BP). Paralyses were related to lesions of a single PN in 115 patients, to two in 89, to the upper BP in 54, to extended upper BP in 39, to the lower BP in 28 and the entire BP in 26 patients.
Methods: In all 466 reconstructions were performed. Primary PN (n = 135) or BP reconstruction (n = 113) was done in 248 patients, where nerve suture, grafting and transfers were employed. In longstanding flaccid paralyses, we performed 218 limb reanimations using tendon transfers (n = 44), regional muscle transfers (n = 12), and free functional muscle transplantation (n = 162). The results were assessed using the BMRC grading and the Neutral-Null-system for PN injuries (130/204 answered) and by the German-DASH for BP injuries (98/147 responded).
Results: Favourable outcomes, as pertinent to patients' ability to use the reinnervated muscles after primary reconstruction was achieved in 45% (BP) and 88% (PN) of the cases respectively. Contrarily, secondary functional reanimation produced favourable results in 66% (BP) and 99% (PN). The individual statistics of the analyses will be delivered during the presentation.
Conclusions: In complex neural injuries, only the combination of primary nerve repair with modern limb reanimation strategies, can impart useful function to the paralyzed extremity. Even here, only 66% of the patients seem to have profited. A search for further alternatives to improve function after neuronal damage is mandated.

References:

1. Berger A, Schaller E, Mailänder P. Brachial plexus injuries: an integrated treatment concept. *Ann Plast Surg* 1991;26(1):70–6.
2. Krishnan KG, Martin KD, Schackert G. Traumatic lesions of the brachial plexus: an analysis of outcomes in primary brachial plexus reconstruction and secondary functional arm reanimation. *Neurosurgery* 2008;62(4):873–85.

WPM1-2: Establishing a new Neurotrauma Centre – Issues and Data from the first 4 months

M. H. Wilson, D. Baxter, R. Vashi, S. Agius, S. Ansari, F. Arnold & D. Peterson (Imperial Hospitals NHS Trust, London, UK)

Objectives: To report the governance issues relating to the establishment of a Neurotrauma centre within London and to report the data for the first 4 months of operation. (6 months by time of SBNS meeting)
Design: Following the 2007 Darzi Healthcare for London Review, the development of four Major Trauma Centres for London was proposed. The most recent of these to go online required the

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development of an isolated neurotrauma service. Although allied to a non-trauma neurosurgical centre, this was the first new neurosurgical facility in 30 years. The SBNS provided input stating requirements including 4 Consultant and 6 Registrar posts. Many other governance processes and decisions such as equipment requirements (do you need Stealth/a Microscope?) needed to be implemented. Admission pathways (that sometimes bypass neurosurgical discussion) were developed. Emergency, ITU, Ward and Theatre staff underwent Neurosurgical training.

Subjects: In the first 4 months (January to April 2011) we received 173 patients to the Major Trauma and Intensive care wards. In total during this time, we received 290 referrals.The commonest mechanisms of injury were road traffic accidents and falls. Approximately 8% of these were for non-traumatic conditions that presented through our own Emergency Department. Hence, ethically, with a neurosurgical presence, an acute non-trauma service has to be provided when transfer for logistical or clinical reasons is not possible.

Methods: The Major Trauma Centre went live during daylight hours in December 2010 and 24 hours a day in January 2011. Data for the Trauma Audit Research Network and our own comprehensive database including pre-hospital, in hospital and outcome data is recorded.

Results: Processes that have been put in place include daily 8:00am ward rounds with the trauma team on both ITU and the trauma ward, a robust documentation system, and an educational programme. Recruiting staff to an isolated trauma centre is also difficult and hence incentives (such as academic projects and elective work at our sister hospital) have to be provided. The service has been markedly busier than predicted. A breakdown of the cases and outcome data will be presented.

Conclusions: There are many issues with establishing an isolated neurotrauma service. These will effect other Neurosurgical centres that are required to provide such as service to Major Trauma Centres. This presentation outlines our experience of dealing with these issues and our initial work load and results.

References:

1. NAO. Major Trauma Care in England 2010.
2. London Trauma Network Website: http://www.londontraumaoffice.nhs.uk/londons-trauma-system/

WPM1-3: Endoscopic Endonasal Skull Base Surgery: Experience With First 100 Procedures

S. S. Wahab, S. B. Nair & N. Mathad (Wessex Neurological Centre, Southampton)

Objectives: The endoscopic approach to skull base lesions is becoming a widely accepted alternative to more traditional approaches. It requires combined skills of an ENT surgeon and neurosurgeon. We started endoscopic approach in our unit from January 2007. This study was undertaken to review our progress since.

Design: Retrospective analysis of the first 100 cases of endonasal endoscopic skull base surgery performed in our unit.

Subjects: A total of 100 endoscopic endonasal operations were performed on 92 patients. 50 were female with a mean age of 55.5 years (range 20–85). 42 were male with a mean age of 55.5 years (range 6–87).

Methods: We have analysed all case notes, imaging and operative videos.

Results: 57 procedures were for pituitary tumours. Other 43 were for a diverse case mix of skull base lesions and skull base repairs.

Only 6 per cent of the entire group experienced CSF leaks post-operatively. Postoperative haemorrhage was seen in 2 patients, DI in five patients and meningitis in 3 patients. Our complication rate is comparable to other more traditional approaches used.

Learning curve and shorter length of stay demonstrated. Visual and endocrine outcomes are encouraging.

Conclusions: Our preliminary results are encouraging. We have found that endonasal endoscopic surgery is a safe procedure. It shortens the hospital stay. It requires a combination of skills, ENT surgeons and neurosurgeons working simultaneously at all stages of the operation. This is critical for safe surgery. There is a short learning curve.

WPM1-4: Seizure control in Dysembryoplastic Neuroepithelial Tumours in Children

T. Elias[1], N. Biyani[1], T. Jacques[1,2] & W. Harkness[1] ([1]Great Ormond Street Hopsital for Children, [2]UCL Institute of Child Health, London)

Objectives: Dysembryoplastic Neuroepithelial tumours are developmental tumours, usually associated with medically refractory epilepsy. This study was undertaken to determine the seizure outcome after resection of these tumours.

Design: This is a retrospective review of paediatric patients who presented with epilepsy, and who had histologically confirmed Dysembryoplstic Neuroepithelial tumours, from 1991 to 2010.

Subjects: A total of 100 children were eligible for this study.

Methods: We reviewed medical records including sex, age at seizure onset, age at surgery, seizure type, lesion location and outcome with respect to seizure control.

Results: There were 62 boys and 38 girls, with age range 6 months to 17.5 years (mean 10.5 years). Tumours fell into two broad groups: those with classical diagnostic features of DNT (classic) e.g. the

specific glioneuronal element, and those with features suggestive but not diagnostic of DNT (probable DNT). There were 60 in the classic group and 40 in the probable group. Of the 100, only 5 underwent repeat procedures for poor seizure control. The major complications included 3 with temporary motor deficits, 3 with subdural haematoma that needed evacuation and 2 children with CSF leaks. The follow-up ranged from 1 month to 18.3 years (mean of 3.75 years). 5 were lost to follow-up. In the classic group, 38 children (63%) were seizure-free (Engel class1A) and discontinued the antiepileptic medication, while 11 children (18%) were in 1B, 2 in class 3, and 6 in class IV. In the probable group of 40 patients, complete seizure control was obtained in 26 (65%), while 8 children (20%) were in class 1B, 2 in class III, and 2 in class IV.

Conclusions: Resection of DNTs is associated with good seizure control. Residual lesions may be followed up with frequent scans, and reoperations may be undertaken if seizures are not adequately controlled.

WPM1-5: Outcome and Prognostic Features in Adult Pineoblastomas: analysis of cases from the SEER database

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Objectives: Adult pineoblastomas (PBL) are rare central nervous system tumours. Patient and treatment factors associated with outcome are poorly defined and limited to small retrospective case series and case reports.

Design: The Surveillance, Epidemiology, and End Results (SEER) database is considered the gold standard of all national cancer registries. Using this database, we investigated factors associated with outcome in adult PBL patients.

Subjects: Adult patients (16 years old and above) with PBL diagnosed between 1990–2007 were identified from the SEER database.

Methods: Kaplan-Meier survival analysis and Cox models were used to examine the effect of variables on overall survival. The variables analysed included patient's age at diagnosis, gender, tumour location, uni-focal or multi-focal tumour, tumour size, surgical resection and the use of adjuvant radiotherapy.

Results: Ninety-five patients were identified, with a median age at diagnosis of 39.2 years. Sixty-one patients (64%) underwent surgery and forty-four patients (44%) received adjuvant radiotherapy. Forty-two patients (44%) had both surgery and radiotherapy. The median overall survival was 176 months. Univariate analysis identified younger age at diagnosis, uni-focal and localised disease as important predictors of overall survival. On multivariate analysis, only age at diagnosis and localised disease emerged as important prognostic factors.

Conclusions: This study represents the largest analysis of adult PBL to date. Clinically relevant prognostic factors were younger age of diagnosis and localised disease. Surgery and adjuvant radiotherapy did not influence overall survival. This study also emphasises the role of national tumour databases for furthering our understanding of rare brain tumours and determining management options.

WPM1-6: Regression of chronic hindbrain hernia following posterior calvarial augmentation in children: New insights into pathology of hindbrain hernia

U. Farooq, G. Solanski, W. Lo, G. Paternoster & P. Davies (Birmingham Children's Hospital, Birmingham, UK)

Objectives:

1. To assess this hypothesis with pre and post-op morphometric measurements in supra and infratentorial compartments.
2. To assess the effectiveness of posterior calvarial augmentation(PCA) as an alternative surgical option to PF craniectomy for hindbrain hernia.

Design: A retrospective study reviewing pre and post posterior calvarial augmentation MR scans of children between 2002 to 2008.

Subjects: It is well known that reduced posterior fossa (PF) volume is linked to Chiari & Syrinx formation. We hypothesise that in some cases, there is an additional effect of supratentorial(ST) crowding that effectively reduces the functional infratentorial space and may be a major factor leading to tonsillar hernia & syringomyelia.

Methods: Children undergoing posterior calvarial augmentation between 2002 to 2008, were reviewed. Parameters measured included tonsillar hernia, midline sagittal PF and ST cross-sectional area(SA) and height, PF angles(apical, clival) on MRI. No PF decompression, dural expansion, or tonsillectomy were performed.

Results: All thirteen children(M-9,F-4,M:F-2.25) improved symptomatically. Tonsillar hernia regression was noted without surgical PF expansion or tonsillectomy. Median tonsillar hernia regression was 50% ($p < 0.001$). Supratentorial height increased by 14% ($p < 0.001$). SA increased by 7.36% ($p < 0.0031$). The PF height flattened(reduced clival angle $-7.9?$ ($p < 0.0031$), increased apical angle $+8.0?$ ($p < 0.0241$). PF SA increased by 12% ($p < 0.001$) post operatively.

Conclusions:

1. Hindbrain hernia may be partly due to supratentorial crowding. In this study, its expansion has been shown to neutralize or reverse the hernia. Specifically, Posterior Calvarial Augmentation led to 50% reduction in tonsillar hernia associated with a combined increase in supratentorial and PF compartments.
2. Posterior Calvarial augmentation appears to be an effective surgical option for correction of hindbrain hernia in this group of children.

Neurovascular

WPM2-1: STICH II: Update on Progress

B. A. Gregson[1], E. N. Rowan[1], A. Andras[1], P. Mitchell[2], A. D. Mendelow[1] on behalf of STICH II Investigators (Newcastle University, Newcastle upon Tyne, UK[1] and Royal Victoria Infirmary, Newcastle upon Tyne, UK[2])

Objectives: STICH II is an NIHR EME (formerly MRC) funded trial to evaluate whether a policy of early surgery improves outcome compared to a policy of initial conservative treatment in patients with spontaneous superficial lobar intracerebral haemorrhage (LICH).
Design: This is an international multicentre pragmatic randomised controlled trial.
Subjects: Patients with LICH are eligible if they have a GCS motor score of 5 or 6 and a GCS eye score of 2 or more and are within 4824 hours of ictus. The haematoma should be between 10 and 100 ml and there should be no blood in the ventricles.
Methods: Patients are randomised using an independent automatic telephone or web-based service. Those randomised to surgery should have craniotomy within 12 hours. Outcome is measured via a postal questionnaire to patients at six months.
Results: On 30 April 2011 442 patients had been recruited from 66 centres including 68 patients from 11 centres in the UK. Patients had a median age of 65 and a median GCS of 13 at recruitment. The median haematoma volume was 37ml. Of those randomised to surgery 43% had the surgery within 3 hours of randomisation. The crossover rate (within 12 hrs) was 6%. By two weeks 35% had been discharged from hospital and 7% had died. Outcome data had been obtained for 94% of the first 350 patients; 23% had died and 45% had severe disability.
Conclusions: Crossover rates are lower than in STICH I. Follow up rates are very high. The trial plans to complete recruitment within a year with the help of the investigators. Results will be reported in early 2013.

WPM2-2: The Use of Lumbar Puncture in the Diagnosis of Subarachnoid Haemorrhage

D. Sayer, H. Marcus & T. Harris (Neurosurgery Department, Royal London Hospital, London, UK)

Objectives: Report a large case series of xanthochromia testing in CT negative suspected subarachnoid haemorrhage (SAH).

Add to the evidence of whether lumbar puncture (LP) is indicated in CT negative suspected SAH.
Design: Prospective case series of all LPs performed over four years at a large teaching hospital.
Subjects: 246 consecutive patients, presenting with a CT negative suspected SAH.
Methods: Results of LP for each patient who had a negative CT were investigated. All positive or inconclusive samples were analysed for further investigations performed and final outcome.
Results: 246 LPs performed. 205 (83.3%) were negative. 28 of the negative samples were insufficient, only 5 (18%) of these underwent further investigation. Only 6 (2.4%) positive samples contained bilirubin. Further investigations showed these were positive for reasons other than SAH.

The remaining positive samples (35) had pigments, mainly oxyhaemoglobin, that could mask bilirubin. Only 4 of these patients had further investigation. Overall none of the 246 patients were proved to have a SAH after a negative CT head.
Conclusions: Few LPs were positive; all of these had an alternative explanation to SAH.

A large proportion of LPs performed did not answer the question of whether or not a SAH was present. Few of these were investigated further. This study is evidence against the current strategy of performing LPs for patients with CT negative suspected SAH. This exposes patients to the morbidity of LPs without adding extra benefit. We speculate that the negative results are a consequence of increased sensitivity of current CT scanning.

WPM2-3: Brain perfusion SPECT and Serum Neuro-specific Enolase (NSE) in patients with spontaneous Subarachnoid Hemorrhage (SAH)

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Objectives: To determine the correlation between Brain perfusion SPECT with with Technetium-99m-ethyl cysteinate dimmer (99m Tc-ECD) and Serum Neuro-specific Enolase (NSE) in patients with spontaneous Subaracnoid Hemorrhage (SAH).
Design: Prospective study.Inclusion criteria for the study were as follows: adult patients over 20 havins

SAH, and in possesion of complete charts, including preoperative and postoperative clinical evaluation, outcome, follow-up, pre- and post-operative CT-scan/SPECT.
Subjects: Thirty-five (35) patients with the diagnosis of SAH were included in our study.
Methods: Admission computed tomography (CT), single photon emission computed tomography (SPECT), were analyzed. Serum concentration of NSE were measured within on admission. We used SPECT in 35 studies equal in number with 35 patients with clinical vasospasm. The three difference isoforms of enolase (a, β, γ) are found mainly as homodimers specific to different tissues. γ-subunit of enolase is prevalent in neurons, so called NSE. The detection and mesured of this protein in serum was done by immunoradiometric assay method (IRMA).The Glassgow outcome scale (GOS) assessed six months after SAH.
Results: 1SPECT brain perfusion is a tridimensional functional neuroimaging technique that allows noninvasive study of physiology and physiopathology events in human brain.The degree of hypoperfusion was measured semi-quantitatively by use of symmetrical regions of interest (ROIs). A summed perfusion defect score (SPDS) was used to quantify the extent and severity of perfusion abnormalities.
Conclusions: According to our study there is a strong relationship between SPECT abnormal areas and NSE levels, on admission with coreelation coefficient of 0.7107, statistically significant at a significance level of 0.05. Our results do not show any clear correlation between the Spect/SPDS and GOS values. Finally there are three distinct regions of NSE levels with their own characteristic relationship to GOS levels depends on the serum level of NSE, NSE $<$ 15, NSE $=$ 15–19, NSE $>$ 20.

References:

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2. Brain SPECT in Clinical Practice. Part I: Perfution. Catafau A. *J Nucl Med* 2001;42:259–271.

WPM2-4: Simvastatin improves outcomes in subarachnoid haemorrhage with heavy blood load: Results from a single centre audit

S. R. Chakraborti, J. Ling, C. Tolias & D. Walsh (King's College Hospital, London, UK)

Objectives: To audit statin therapy in a large neurovascular unit in the wake of sequential conflicting publications on efficacy in delayed cerebral ischaemia.
Design: Single centre retrospective, observational cohort study of audit within two surgical firms one of which routinely prescribed a statin to newly diagnosed patients with aneurysmal SAH and another which did not.
Subjects: 150 consecutive patients admitted to the unit with aneurysmal SAH.
Methods: 80 patients received simvastatin and 70 patients did not. Primary outcome measures were: modified Rankin score (mRS) and extended Glasgow Outcome Score (EGOS). Secondary outcome measure was infarction on CT.
Results: In the statin group at 8 months follow up, the mRS was better (1.1 vs 2.5) as was the eGOS (6.8 vs 5.5). The incidence of infarction was less in the statin group (5% vs 7%). Patients were dichotomised into those with Fisher grade 3 (F3) or those who fulfilled both Fisher 3 criteria and also had intraparencymal/intraventricular blood (F3+F4). In these subsets, the improvement in functional outcome was magnified (MRS 1.0 vs 3.0 and EGOS 7.0 vs 5.3, $p < 0.05$). Incidence of infarction was also significantly reduced in patients who had Fisher 3 or Fisher 3+4 haemorrhages (3% vs 9% for Fisher 3 and 3% vs 8% for Fisher 3+4, $p < 0.05$).
Conclusions: Statin treatment appeared to improve outcome in patients with a heavy blood load. Data from prospective trials is still needed to clarify their potential role in SAH.

References:

1. Sillberg VAH, Wells GA, Perry JJ. Do statins improve outcomes and reduce the incidence of vasospasm after aneurysmal subarachnoid hemorrhage: a meta-analysis. *Stroke* 2008;39:2622–2626.
2. Vergouwen MDI, de Haan RJ, Vermeulen M, Roos Y. Effect of statin treatment on vasospasm, delayed cerebral ischemia, and functional outcome in patients with aneurysmal subarachnoid hemorrhage—a systematic review and meta-analysis update. *Stroke* 2010;47:e52.

WPM2-5: The natural distribution of Subarachnoid Haemorrhage (SAH) by grade at the time of first presentation: do we need the WFNS scale?

C. E. Uff & L. Thorne (Royal Free Hospital)

Objectives: To study the relevance of the WFNS grading scale for aneurysmal SAH in general neurosurgical practice.
Design: Retrospective analysis of database.
Subjects: All acute referrals to a neurosurgical unit over a 5 year period.
Methods: A database of all emergency referrals has been prospectively compiled over a 5 year period. Patients with aneurysmal SAH were identified on the basis of CT or CSF analysis. They were retrospectively graded according to the WFNS scale, based on neurological examination at the time of presentation.

Results: 9729 acute referrals were recorded over a 5 year period from a base population of 2.2 million. A total of 752 referrals were identified as probable aneurysmal SAH (8% of total). Grade 1: 56%, Grade 2: 11%, Grade 3: 4%, Grade 4: 12%, Grade 5: 17%.
Conclusions: The WFNS scale for aneurysmal SAH was created mainly on a retrospective analysis of the Cooperative Study data, and published in 1988. It has become an accepted clinical and research scale but it remains common neurosurgical parlance to describe aneurysmal SAH as ''good'' or ''poor'' grade. This study shows that the great majority of patients fit this description, 67% grades 1 and 2, 29% grades 4 and 5. There seems little practical purpose to the existence of grade 3. We will examine the Glasgow Outcome Scale of this cohort to identify whether the WFNS scale has better prognostic power than a simple description of good and poor grade.

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Drake CG. Report a World Federation of Neurological Surgeons Committee on a Universal Subarachnoid Haemorrhage Scale. *JNeurosurg* 1988;68:1985–4.

WPM2-6: Trajectories for freehand external ventricular drain placement: a geometric analysis in adults with acute hydrocephalus

W. R. Muirhead & S. Basu (Queens Medical Centre, Nottingham, UK)

Objectives: External Ventricular Drains (EVDs) are commonly placed freehand using targeting landmarks unchanged since the pre-CT era; it is known to be an inaccurate procedure. To our knowledge this is the first study to assess the geometric reliability of specific trajectories in a three dimensional model.
Design: 3D volume reconstruction of EVD trajectories in a Stealth Station S7.
Subjects: Adults requiring an EVD for acute hydrocephalus secondary to subarachnoid haemorrhage who also had CT angiography less than 24 hours earlier as part of SAH management protocol.
Methods: The surgical planning tool was used to construct three trajectories from Kocher's point: i) Perpendicular to the skull (PTS) ii) Towards ipsilateral medial canthus coronally and the external auditory meatus sagitally (IMC) iii) towards the contralateral medial canthus coronally and the external auditory meatus sagitally (CMC). The extent of their engagement with the frontal horn of the ipsilateral ventricle (FILV) and distance from the ventricular wall and foramen of Monroe (FOM) were measured.
Results: Ten consecutive patients 2/2009–4/2011 were analysed who met our inclusion criteria. Mean supratentorial ventricular volume was 55.8 cc. The IMC met the FILV in 1 patient, on average missing the ventricular wall by $5.5+/-2.3$ degrees ($p < 0.05$). PTS and CMC met the FILV in 9 and 10 cases respectively. Mean engagement was $16.3+/-5.1$mm ($p < 0.05$) for PTS and $20.1+/-7.1$mm ($p < 0.05$) for CMC. CMC and PTS gave better engagement, aiming error margins and approximation of the FOM than the IMC trajectory ($p < 0.01$).
Conclusions: Despite its widespread use, the IMC trajectory performed poorly; PTS and CMC trajectories are more reliable ways of targeting the FILV when placing an EVD.

WPM2-7: Recovery of Oculomotor Nerve Palsy Secondary to Posterior Communicating Artery Aneurysms

K. Patel, M. R. Guilfoyle, D. O. Bulters, R. W. Kirollos, N. M. Antoun, J. N. Higgins, P. J. Kirkpatrick & R. Trivedi (Department of Neurosurgery, Addenbrookes Hospital, Cambridge, UK)

Objectives: Recent studies suggest a more favourable outcome of oculomotor nerve palsy (ONP), caused by posterior communicating artery (PComA) aneurysms with surgical clipping compared to endovascular coiling. We report the largest series to date of ONP recovery following endovascular or surgical treatment.
Design: Retrospective study.
Subjects: Patients with ONP secondary to ruptured or unruptured PComA aneurysms over a five year period (2005–2009) at a single neurosurgical centre.
Methods: Data were collected for all patients with complete or partial ONP from PcomA aneurysms by review of hospital databases, medical records, and imaging.
Results: Twenty patients were identified, 3 with unruptured aneurysms. Two patients with ruptured aneurysms but unfit for treatment were excluded. Of the 18 patients included (15 female), 9 underwent microsurgical clipping and 9 received endovascular coiling. Patients treated by surgical clipping were significantly younger compared to those treated by endovascular coiling (mean 52.3 vs. 67.9 years; $p = 0.039$). Five patients had incomplete ONP (3 clipped, 2 coiled) and 13 had complete ONP.

At six months, 6 of 9 patients treated with clipping and 5 of 9 patients treated with coiling had complete resolution of their ONP ($p = 1.0$, Fisher's Exact Test); the remainder had partial improvement. There was no significant difference in time to treatment, age, sex, or incidence of rupture between patients with full and partial recovery. However, all 5 patients with incomplete ONP at presentation recovered fully, compared with only 6 of 13 patients with complete ONP.

Conclusions: We found no significant difference between clipping and coiling in the recovery of ONP due to PcomA aneurysms. Incomplete ONP at presentation is more likely to be associated with full recovery of oculomotor function following either treatment.

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2. Outcome of oculomotor nerve palsy from posterior communicating artery aneurysms: comparison of clipping and coiling. Chen PR, Amin-Hanjani S, Albuquerque FC, McDougall C, Zabramski JM, Spetzler RF. *Neurosurgery* 2006 Jun;58(6): 1040–6.

WPM2-8: Endovascular embolisation of acutely ruptured cerebral arteriovenous malformations (AVMs)

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Objectives: Ruptured cerebral AVMs carry a risk of rebleeding with its associated morbidity and mortality. Endovascular embolisation is usually performed as an elective procedure. We report the radiological and clinical outcome of AVMs embolized in the acute phase at our unit.
Design: Retrospective clinical and imaging study.
Subjects: Patients presenting with ruptured intracranial AVMs and treated by endovascular treatment during the same admission.
Methods: Retrospective review of clinical data of neurological status on admission and outcome following discharge of included patients. DSA pre and post embolisation were reviewed retrospectively by an independent neuroradiologist.
Results: A total of 23 patients were included with mean follow up of 1.1 years. 4 patients had surgery following the embolisation. Complete embolisation was achieved in 5 cases, partial embolisation in 15 cases and failed embolisation in 3 cases. Radiologic complications included 3 cases of escape into normal vessel and 1 case of minor sub arachnoid haemorrhage. 14 patients had a good recovery (GOS = 5), 3 patients were moderately disabled (GOS = 4), 3 patients were severely disabled (GOS = 3) by discharge. One patient subsequently rebled. There were no deaths.
Conclusions: Early embolisation is potentially beneficial in facilitating surgery and reducing the risk of acute rebleeds. Further follow-up is needed to establish the effect on clinical outcome.

WPM2-9: Venous sinus thrombosis - should we care?

M. C. Werndle, T. L. Jones, M. J. Crocker, M. C. Papadopoulos (St George's University of London, London, UK)

Objectives: Cerebral venous thrombosis (CVT) poses challenges in management, especially if requiring surgical decompression, in balancing risk of anti-coagulation. We were interested to review all the cases in our unit and to define our role as neurosurgeons.
Design: Retrospective case series.
Subjects: Patients were identified from a combination of clinical coding and theatre log books. Any patient with a primary diagnosis of CVT was included for analysis.
Methods: A retrospective casenote and imaging review was performed on all patients admitted between June 2004 and May 2011. We collected patient demographics, presenting features, risk factors, radiological findings, course in hospital, anti-coagulation details, and if surgery was performed.
Results: A total of 31 cases were admitted. Most patients presented with symptoms of raised ICP (26/31, 84%). 23 (74%) were managed under the neuromedics; 8 (26%) under neurosurgeons, of whom 1 underwent ICP monitoring, 3 decompressive craniectomy. Who managed the patient was not determined by age, nor presence of infarct ($p > 0.1$), however there was a non-significant trend for neurosurgical care if haemorrhage was present on imaging ($p = 0.077$). Of note, the majority of patients were referred to neurosurgery at some point during their admission. All patients were anti-coagulated, although this was delayed in the surgically treated patients. On discharge, 4 patients had died, and on follow up, a further 3 were dead or severely disabled (mRS 5 or 6 = 23%, 7/31).
Conclusions: Although CVT remains a primarily neuromedical condition, neurosurgeons still play a significant role in advice and management. The timing of anticoagulation in surgically treated patients has yet to be defined.

Oncology/Radiosurgery 1

TAM1-1: Peri-operative real time surgical interrogation of GBM using fluorescence-guided sampling identifies regional heterogeneity of tumour competence

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Objectives: The most lethal tumour of the Central Nervous System is Glioblastoma Multiforme (GBM)

which accounts for over 60% of brain tumours. Median life expectancy in optimally managed patients is only 12–14 months with only 25% surviving 24 months. Thus the need for new treatments is an unmet clinical need. This study compared variations in gene expression, metabolic activity and tumour competence from the tumour mass (TM), tumour margin (M) and sub-ependymal region (SEZ) of the same patient.

Design: Consent was obtained in our research clinic. Peri-operative neuronavigation was combined with realtime fluorescence to identify sampling targets.

Subjects: Tissue samples were collected from 20 patients with suspected GBM. Peri-operative smear analysis confirmed high grade glioma is each case. We noted 100% congruence between fluorescence and an histological diagnosis of GBM in this patient cohort.

Methods: TM, M and SEZ were identified based on fluorescent and anatomical criteria. Primary culture, culture propagation, cell line establishment, multiple immunofluorescence and intracerebral transplantation of 3X105 GBM cells into the right striatum of immunosuppressed mice were performed as reported previously (1).

Cytogenetic and molecular abnormalities were detected using QFQ banding and SNP arrays. Data were confirmed by microsatellite analysis.

HRMAS spectra from tumour samples were obtained using a 600MHz Bruker NMR at 500 kHz spinning frequency at 4°C.

Results: Here we show that different regions of the same GBM can be objectively identified by the use of 5-aminolevulinic acid. This technique objectively discriminates distinct compartments (mass, necrotic and margin) and does not alter the 90% efficiency of derivation of CSCs from GBM nor their metabolism. Of note, only the cells derived from the mass give rise to multipotent long-term expanding CSCs. Cells isolated from necrotic areas do not grow in vitro and all die after a few days in culture. Margin cells do not grow under stem cell conditions and show a different metabolism from cells isolated from the mass. More interestingly, some margin cells are tumorigenic in vivo similarly to the CSCs isolated from the mass of the same tumours.

Conclusions: Our findings show that different regions of the same human GBM can be objectively identified by the use of 5-aminolevulinic acid. Our data suggest that margin cells retain the tumour-initiating ability but do not fulfil the criteria of CSCs.

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1. Fael al-Mayhani MT, *et al*. An efficient method for derivation and propagation of glioma-initiating cell lines that conserve the molecular profile of their parent tumours. *J.Neurosci.Methods* 2009;176:192.

TAM1-2: The effects of the National Institute of Clinical Excellence guidelines (carmustine implants and temozolomide) on survival in high-grade glioma

J. G. Barr & P. Grundy (Wessex Neurological Centre, Southampton, UK)

Objectives: The prognosis of high-grade glioma (HGG) is poor with a median survival of about 1 year for glioblastoma. In 2007 NICE published a technology appraisal recommending the use of carmustine wafers (Gliadel) and systemic therapy with temozolomide for selected patients with HGG. Outcomes for HGG surgery in the UK with these combined treatments have not been published.

Design: Retrospective audit of consecutive patients in a single unit with carmustine wafer implantation.

Subjects: 59 patients had carmustine wafer implantation at primary surgery, between October 2005 and October 2010.

Methods: Patients were given chemotherapeutic treatments strictly according to NICE guidelines. Survival was calculated using the Kaplan Meier method.

Results: 55 patients had WHO grade IV tumours and 4 had grade III tumours. Mean age was 61 years. Median survival was 15.3 months. 8 patients had post operative complications for which 4 had the wafers removed. 48 patients had radical radiotherapy. 37 patients had concomitant temozolomide chemotherapy with radiotherapy. In this subset of 37 patients median survival was 15.8 months compared with 7.4 months $p < 0.01$ in those not receiving this multimodal treatment.

Conclusions: Carmustine wafers for primary HGG surgery in accordance with the NICE guidelines were associated with a median survival of 15.3 months. Multimodal treatment with carmustine wafers, radical radiotherapy and concomitant temozolomide was associated with improved survival.

TAM1-3: Cerebral lymphoma: to biopsy or not to biopsy?

E. A. C. Pereira, J. Livermore, O. Ansorge & S. Bojanic (John Radcliffe Hospital, Oxford, UK)

Objectives: Cerebral lymphoma can be diagnosed by vitreous or cerebrospinal fluid sampling but brain tumour tissue is desirable to guide medical treatment. Limited literature suggests high haemorrhage rates with cerebral lymphoma biopsy (14%). The study aimed to assess this.

Design: Retrospective single centre case series.

Subjects: 47 consecutive adults diagnosed with histologically confirmed cerebral lymphoma over four years from December 2006 to January 2011 compared to a 96 patient cohort receiving cerebral

biopsies for other pathologies over one year from August 2009 to July 2010.
Methods: Assessment of case notes and imaging and Chi squared tests.
Results: 37 of 47 lymphoma patients (79%) received biopsy (29 by framed stereotaxy and 8 frameless). Male:female ratio was 19:18 and mean age at surgery 60 years (range 29–80). 10 patients received craniotomy and surgical resection of lymphoma. 27% of tumours were thalamic and 8% brainstem. 5 symptomatic haemorrhages happened in the lymphoma cohort, 4/13 in the 11% receiving thalamic or brainstem biopsies and one (3%) in a patient after frontal craniotomy and resection. There was one death from thalamic haemorrhage. There were no significant differences in bleed rates between lymphoma biopsies overall (4/37) and other biopsies (5/91). Brainstem and thalamic lymphoma biopsies were significantly higher risk (Chi squared $p < 0.05$, OR 4.4, CI 1.3–26) than other biopsies overall.
Conclusions: Approximately 12 cerebral lymphomas present per year to our centre serving three million people. Histopathology demonstrates vascular endothelial compromise increasing haemorrhage risk. Thalamic and brainstem lymphoma biopsies are high risk with up to 30% haemorrhage and 7% mortality comparable to the limited published literature. Diagnosis enabling medical treatment should be made from vitreous biopsy and cerebrospinal fluid sampling if possible, and perhaps even on clinical context and imaging alone if only palliation is considered.

TAM1-4: Is it safe to refer preoperative patients to the neuro-oncology MDT?

R. Corns, A. Kumar, T. Rittman, R. Bhangoo & K. Ashkan (Department of Neurosurgery, King's College Hospital, London, UK)

Objectives: Current NICE guidelines advise that all suspected brain tumours are referred preoperatively to the weekly neuro-oncology MDT. However, we felt this raised a safety concern as a patient with a cerebral abscess may be inadvertently referred and hence have their definitive treatment delayed.
Design: A retrospective case review.
Subjects: 222 patients referred to our regional neurosurgery unit with suspected CNS tumours. We reviewed their case notes, comparing two groups who were referred before and after the introduction of the neuro-oncology MDT.
Methods: Patients were identified via clinical coding and our neuro-oncology database. Data was collected on suspected preoperative diagnosis, what imaging was available (CT, MRI), blood tests (CRP, WCC), and time from referral to surgery.
Results: Four patients with brain abscesses were referred via the neuro-oncology MDT. This resulted in a significant delay in treatment (6 days vs. 1 day). Median time to operation for brain tumours was also longer following the introduction of the MDT (9 days vs. 8 days). There did not appear to be any lasting harm to the patients whose treatment of their brain abscess was delayed. When preoperative MRI was available, no misdiagnoses were observed.
Conclusions: The MDT process may lead to delay in patient transfer, particularly important if abscess is the underling diagnosis. An MRI scan is invaluable in minimising the risk of such misdiagnosis.

TAM1-5: Surgical management of pineal region tumours; a twenty-five year series

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Objectives: The ideal surgical approach to pineal region tumours, positioning, extent of operation (biopsy vs. excision), anaesthetic and surgical morbidity, and optimal oncological management continue to be controversial.
Design: Retrospective review.
Subjects: 69 patients harbouring pineal region tumours managed between 1984–2010.
Methods: Names retrieved from neuropathological database. Medical notes and imaging were drawn. Demographic, clinical, radiological and pathological features, as well aim of surgery, anaesthetic/surgical morbidity, use of adjuvant therapy and survival rates were analysed.
Results: 69 patients identified. Follow up data was available for 45;24 lost to follow-up.24 male, 21 female. Mean age 36(range 4–70); mean follow up period 38 months (range 2 months-23 years). 38(84%) presented with symptoms of raised ICP; 13 (29%) with Parinaud's; 10(22%) with ataxia; 8(18%) with cognitive impairment, 3(7%) with seizures. Drop metastases were present in 3(7%). 26(58%) underwent biopsy. 20(40%) underwent surgical resection; 36(80%) required shunt. 5(11%) patients underwent 3rd ventriculostomy. Of 24 surgical resections, 14 were partial and 10 total. Approaches for the 24 resections included supracelebellar-infratentorial (18,75%), occipital-transtentorial (5, 21%) and posterior transcallosal (1, 4%). Histology showed 19(43%) pineal parenchymal tumours (6 pineocytomas, 9 pineoblastomas and 4 mixed pineocytoma/blastoma); 9(20%) germ cell tumours; 8(18%) glial tumours; 2(4%) papillary tumours and 2(4%) metastatic tumours. 2(4%) biopsies demonstrated cysts. Procedures were uneventful in 35 (80%) cases. One patient had fatal air

embolism and two brain stem infarctions. Radiotherapy given in 25(64%) of patients (parenchymal, glial and germinomas). There was a 64% radiological recurrence in the pineoblastoma and mixed parenchymal tumours at 3yrs.
Conclusions: The ideal management of pineal region tumours remains case-based.In adults, extremely radiosensitive germinomas are much less common than in paediatric population.The approach of choice remains the supracelebellar-infratentorial. Pineoblastomas continue to have a very poor outcome. Endoscopic third ventriculostomy has emerged as a procedure of choice in the last 3 years. Air embolism remains a risk. A series with a bigger cohort of patients would be desirable for this rare surgical entity.

TAM1-6: Primary CNS Lymphoma – a Series of 26 Patients

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Objectives: Primary CNS lymphoma remains rare with an incidence of up to 2% of all primary brain tumours. Treatment usually follows a diagnostic biopsy and consists of whole-brain radiotherapy with or without chemotherapy. Survival rates vary significantly depending on treatment modalities. We present our series of 26 patients diagnosed over a period of 28 months.
Design: Retrospective longitudinal cohort study of patients diagnosed with primary CNS lymphoma.
Subjects: 26 patients were diagnosed during the study period. The inclusion criterion was any patient diagnosed with cerebral lymphoma. Exclusion criteria were patients with spinal and/or systemic lymphoma. Of the 26, 50% (13) were male and median age at diagnosis was 69.5 (range 29–85).
Methods: The primary outcome measure was predetermined as all cause mortality. Survival statistics from date of diagnosis were calculated using Kaplan-Meier survival analysis on SPSS software, version 17.0 (SPSS, Chicago, IL, USA).
Results: A total of 9 patients (34.6%) died during the follow up period. Mean survival time in this sample was 32 months post diagnosis (95% CI 23.2 – 41.7 months). At 6 months survival probability was 77% (95% CI 60%–93%) at 12 months survival probability was 69% (95% CI 51%–87%) and at 24 months survival probability was 60% (95% CI 38%–83%).
Conclusions: Analysis of our population sample showed that the incidence of primary CNS lymphoma to be 0.8 per 100,000. We found that our survival rates exceeded those quoted in the literature.

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TAM1-1: CSF cytology and Spine MRI in diagnosis of metastatic seeding in posterior fossa tumours: Do they identify different types of metastatic disease?

P. Pisano, W. Lo, G. Paternoster & G. Solanki (Birmingham Children Hospital, Birmingham, UK)

Objectives: Leptomeningeal metastatic disease (LMD) significantly affects the prognosis of posterior fossa tumours (PFT). CSF examination for malignant cells and spinal MRI are routinely used to diagnose metastasis It is unclear if CSF examination is useful for all tumour types and their current use is generally limited to PNET/Medulloblastoma.
Methods: We studied 59 patients with PFT (33 medulloblastoma, 12 ependymoma, 12 pilocytic astrocytoma, 2 ATRT/atypical teratoidrabdoid tumour). Median age was 7 (range:1–14) years. Eight patients with metastasis at diagnosis were excluded: 7 medulloblastomas, 1 pilocytic astrocytoma. CSF cytology and spinalMRI reviewed independently for the presence of LMD. Post-operative brain and spine MRIs performed 6-monthly; median follow-up: 17 months. CSF for cytology obtained by lumbar puncture (47), ventricular (3), intra-operative CSF (9).
Results: 5/51 children, medulloblastoma(2), ependymoma(1), pylocytic astrocytoma(1), ATRT(1) were CSF-positive for malignant cells. Median time to diagnosis was 6.5 (range:0.5–26) months post-op. There was no LMD on MRI in all 5 cases. In 6/51 children, medulloblastoma (5), ATRT(1), MRI showed LMD at median interval of 17(range: 4–32) months. Metastasis was synchronous with recurrence in 2. CSF-cytology was negative in all 6 cases. MRI noted subpialplaque/nodular mass lesions.
Conclusions: Overall eleven patients(20%) had post-op metastasis. CSF/MRI findings were discordant in all cases. Nodular/subpial lesions were detected by MRI. Leptomeningialdisease (without nodular lesions)was diagnosed by CSF-cytology. Interval to CSF-seeding was half that of MRI-detected lesions. CSF-cytology also identified metastasis in different histology types (besides medulloblastoma), suggesting the need for CSF sampling of all PF tumours. All metastasis but one, occurred in grade III and IV tumours.

TAM1-2: Posterior fossa tumour (PFT) and gait disturbance in the paediatric population: The effect of debulking surgery

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Objectives: Normal gait is a complex movement, dependent on proprioception, balance, strength and coordination. Gait is often impaired in children with posterior fossa tumours. However, this relationship is poorly understood and requires elucidating.
Aims: 1) To determine the incidence of gait abnormality at diagnosis and review associated factors. 2) To assess the prevalence of post-operative gait abnormality and correlate with pre-operative status.
Design: Retrospective review over 5 years at a regional paediatric neurosurgery centre.
Subjects: Children who underwent debulking of posterior fossa tumour. Patients presented with metastatic disease were excluded.
Methods: Patients with physiotherapy notes available underwent further analysis. Grading of gait was based on Brief Ataxia Rating Score.
Results: There were 34 patients (M-21, F-13, M:F ratio = 1.6) with median age of 72 months. Thirteen were pilocytic astrocytomas (38%), 12 medulloblastomas (35%), 6 ependymomas (18%), and 3 others (9%). Main presenting symptoms were: 23 gait abnormality (64%), 21 headache (21%), 16 vomiting (44%).

Younger patients and those with a longer history were more likely to present with gait abnormality. Sex, histology, WHO grading, tumour size, location and hydrocephalus were not associated with gait abnormality.

For analysis, subjects with physiotherapy notes were divided into those presenting with/without gait-related symptoms (11 and 8 patients). For those presenting with gait abnormality, 4 improved post-operatively (36%), 6 remained unchanged (55%). For those presenting with normal gait, 7 remained unchanged (88%).
Conclusions: Gait abnormality is the most common presenting feature in children with PFTs. Patients presenting with gait abnormality are younger. Children presenting with gait abnormality improved post-operatively. Patients who had normal gait pre-operatively did not deteriorate after surgery.

TAM1-3: Diagnostic Problems in Primary CNS Lymphomas treated with steroids

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Objectives: Primary CNS Lymphomas (PCNSL) has increased in incidence and account for approximately 6% of primary intracranial neoplasms. The increase is in both immunodeficient and immunocompetent patients. PCNSL is described as the ''Ghost or Vanishing tumour'' due to its dramatic response to steroids. Imaging abnormalities may disappear following steroid therapy. If biopsy is undertaken following dexamethasone treatment, the tissue sampled may not be diagnostic.
Design: Prospective and retrospective analysis.
Subjects: Six male patients of ages between 47 and 74 years.
Methods: All the six patients underwent stereotactic biopsy.
Results: In 3 patients, initial biopsy was not diagnostic due to the successful effect of steroids on the tumour, causing it to ''vanish'' and repeat biopsy had to be undertaken following a steroid- free interval. In the 4th patient, the tissue response led to a misleading diagnosis at frozen section. In the other two patients the procedure of stereotactic biopsy was deferred because reimaging revealed disappearance of the abnormalities under the effect of steroids. One of the patients had a biopsy taken after steroid-free interval confirming PCNSL and the other patient died of acute myocardial infarction while awaiting the biopsy.
Conclusions: We recommend careful use and avoidance where possible of empirical steroid treatment when PCNSL is suspected clinically or radiologically. This should enable appropriate treatment to be started without delay. It should also reduce the morbidity related to repeat neurosurgical procedures needed to confirm the diagnosis. With new regimes of chemotherapy e.g. Ferrari, best practice requires a positive tissue diagnosis.

TAM1-4: A preliminary experience with cranial Cyberknife

M. Murphy, A. Richmond, S. McCaighy, P. Richardson & F. Afshar (The London Clinic, London, UK)

Objectives: To present a preliminary UK experience with delivery of frameless, robotic radiosurgery for intracranial conditions.
Design: Observational study.
Subjects: All patients undergoing cranial cyberknife treatment between Dec 2009 and May 2010.
Methods: Details for patients attending for treatment are gathered contemporaneously. All patients are interviewed by telephone 1–2 weeks after to allow them to report any effects/symptoms.
Results: Fifty-three cranial cyberknife cases were performed. The indication was malignant tumour in 23, benign tumour in 21, trigeminal neuralgia in 8, AVM in 6 and cavernoma in 1. There were no severe acute side-effects. Many of the patients who underwent treatment were unsuitable for any other form of treatment.
Conclusions: No serious early complications were seen. The procedure was well tolerated.

TAM1-5: Recurrent high grade glioma after local Carmustine wafer implant into the tumour bed. Does residual tumour affect progression?

S. R. M. Qadri, M. D. Jenkinson & A. Brodbelt (Walton Centre for Neurology and Neurosurgery, Liverpool, United Kingdom)

Objectives: To evaluate the effect of Gliadel wafers on the growth of recurrent high grade Glioma.
Design: Retrospective review.
Subjects: 14 patients with HGG (Glioblastoma) treated with Gliadel wafers after surgical resection were retrospectively analysed.
Methods: 14 patients with HGG (Glioblastoma) treated with Gliadel wafers after surgical resection were retrospectively analysed. The aim of surgery was GTR. Selection criteria for Gliadel insertion were an ECOG performance score of 0–1, 6 months recurrence free survival after completing the treatment protocol, and tumour location suitable for GTR. Patients were then followed up with serial scans and the time of recurrence or progression noted.
Results: 13/14 patients had recurrent GBM on follow up scans. 3/13 had residual tumour on follow up imaging after resection. One patient with GBM died without follow up imaging. Patients with recurrent GBM with GTR had a mean time to recurrence of 24 weeks. Patients with residual GBM (N = 3) had a mean time to progression of 13 weeks (range 4–28 weeks).
Conclusions: Gross total resection of recurrent HGG at Gliadel insertion was associated with a longer progression free interval as documented with follow-up imaging. Guidance with another modality like intra-operative MRI to ensure gross total resection of HGG may be useful for better outcome.

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2. Fleming AB, Saltzman WM: Pharmacokinetics of the carmustine implant. *Clin Pharmacokinet* 2002;41:403–419.

TAM1-6: Gamma Knife Stereotactic Radiosurgery (GKSRS) for the treatment of Glomus tumours (GT): A single centre study

S. Murahari, H. I. Sabin, J. Wadley, P. N. Plowman, M. Gleeson & T. P. D. Blackburn (St. Bartholomew's hospital, West Smithfields, London)

Objectives: To demonstrate the efficacy and safety of GKSRS for the treatment of Glomus tumours.
Design: Retrospective analysis of the effect of Gamma Knife radiosurgery on clinical and radiological outcome on glomus tumours.
Subjects: Between January 2002 and September 2010 twenty four patients (M = 7, F = 17) underwent GKSRS, ten of whom had previously undergone a surgical debulking procedure.
Methods: Median age = 54.9 yrs, mean = 54.1yrs (23.8–78.7). Baseline neurological status was assessed in all patients prior to treatment. Four patients had bilateral tumours (of which only one was treated), and two others had a succinate dehydrogenase complex subunit D (SDHD) mutation. Median tumour mass = 7.45cc, mean = 8.275cc (1.0cc-24.20). Median dose prescription = 16.6Gy (14 - 18).
Results: Two patients were lost to follow up, the remainder being assessed clinically and radiologically at intervals of 6 to 12 months post-treatment. Median follow-up = 21 months, mean = 30.2 months (7 - 87). One patient developed unilateral facial spasm at 6 months, and one other experienced worsening of pre-existing tinnitus. There were no other clinical complications, all remaining patients either stabilising or improving. Radiologically demonstrable tumour mass reduction was seen in 4 patients, the other 18 remaining stable.
Conclusions: GKSRS is a safe and effective means of stabilising neurological deficits and controlling or even reducing tumour mass in the majority of patients with glomus tumours. It should also be considered in patients where an attempt at total excision will entail major risk to lower cranial nerves, and is an excellent adjunct to the safer option of subtotal excision.

Oral Poster

TPM1-1: Dyskalaemia in diffuse axonal injury

D. Cronin, C. Kaliaperumal & G. Kaar (Cork University Hospital, Wilton, Cork, Republic of Ireland)

Objectives: Isolated dyskalaemia in Diffuse axonal injury (DAI) is a rare phenomenon. We report a case of fatal dyskalaemia in a setting of traumatic brain injury in a young man.
Design: Case report and literature review.
Subjects: A 19-year-old man admitted after sustaining head injury. The GCS at presentation was 3/15 with bilateral equal and reactive pupils. No intracranial pathology was evident on the initial CT brain. MRI brain on few days time showed evidence of diffuse axonal injury. During this course of time serum potassium levels dropped suddenly to 2.3 mmol/l. Decompressive craniectomy was later performed for management of increased ICP. Subsequent to this the potassium level was 6.1 mmol/l. This rise in potassium continued despite active medical intervention. Serum sodium and the rest of the electrolytes were within normal levels. He developed an unstable cardiac arrhythmia and died of cardiac arrest.

Methods: MEDLINE searched for ''Dyskalaemia in head injury''.
Results: Diffuse axonal injury with dyskalaemia may present as a challenge in management of traumatic brain injury. In this patient, despite intense medical management serum potassium levels increased resulting in cardiac arrhythmias.
Conclusions: Isolated dyskalaemia is not common seen in Diffuse axonal injury. The possibility of dyskalaemia should be anticipated in diffuse axonal injury. Appropriate management, with the help of intensivists, is the key to avoid undue clinical outcome.

TPM1-2: Women in Neurosurgery

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Objectives: There is little literature looking at gender differences in the neurosurgery workforce.

The UK has seen a recent drive to attract more women into surgical careers, this has been mainly organised through the WinS organisation. This study aimed to present current numbers of female neurosurgeons in the UK and analyse the current trends.
Design: Data was collected from the NHS Information Centre, the WinS group and the Yorkshire and the Humber Deanery.
Subjects: UK neurosurgeons and training applicants.
Methods: Data from applicants for the national selection scheme from the past three years were stratified into gender, whether they were successful and for which level they were entering. Figures were also compared to other surgical specialities.
Results: The overall percentage of women in surgery is 25% and in neurosurgery it is 18.5%. 6.5% of neurosurgery consultants are female; however at more junior grades we see an increase to 28.6% amongst SHO's. This vertical trend is similar in all specialities, but the fastest rate of women entering a speciality is in neurosurgery. The ratio of Male: Female applicants who have accepted their ST1 posts in 2009, 2010 and 2011 have been 7:1, 3:1 and 2:1 respectively.
Conclusions: The growing number of junior grades in neurosurgery appears to have shattered the so-called 'glass ceiling' in what was traditionally a male field. WinS events have promoted career motivation and encouraged normalising the presence of women in surgery in concordance with the 'fit' model. We hope that this changing attitude towards gender roles will attract the best neurosurgeons of the future.

TPM1-3: A review on the length of hospital stay of neurosurgical patients

K. B. Wong & P. M. Bhatt (Neuroscience ward, Aberdeen Royal Infirmary, Aberdeen, UK)

Objectives: The length of hospital stay has a huge impact on NHS. The study was designed to look into the reasons of prolonged stay in hospital.
Design: A prospective review of patients who were admitted for elective and emergency surgery.
Subjects: Every patient who was admitted into the neurosurgical ward.
Methods: An electronic proforma was created to audit on the length of hospital stay between neurosurgical patients in Aberdeen Royal Infirmary from 14th of June to 14th of July 2010. Every patient who was admitted for various reasons was recorded and the details of hospital stay were then recorded.
Results: A total umber of 47 patients were reviewed and more than half of them were for elective surgery, $n = 27$ (47%). There were 13 cases of prolonged hospital stay. Delayed transfer and and transportation issues were accounted for 4 cases respectively. The mean hospital stay for each patient with delayed discharge was 4 days. The study did not show any neurosurgcial related post-op complications that impedes patient's discharge. Only 2 general medical complications were recorded.
Conclusions: The study showed that the reasons for prolonged hospital stay were mainly due to delay in transfer of patients for further rehabilitation and transportation difficulties. Unnecessary prolonged stay in the hospital will have huge implication on cost.

TPM1-4: Managing neuro-oncology referrals: Are we good enough? Experience of a regional referral centre

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Objectives: 1. Assess functionality of a newly implemented MDT neuro-oncology referral tracking system. 2. Assess MDT compliance with Scottish Adult Neuro-Oncology Network and NICE guidelines in brain tumour referral assessment and management.
Design: A retrospective case note analysis for audit.
Subjects: Patients referred to a regional neurosurgery centre since the introduction of the Cancer Care Pathway (CCP) electronic tracking system (September 2010-March 2011).
Methods: Subjects were identified with CCP and key demographic and clinical data were extracted from the database. SPSS v18 was used for analysis.
Results: 138 patients were reviewed by our neuro-oncology MDT (mean age = 52 years old, SD $\pm$ 17).

21.7% (n = 30) obtained a surgical tissue diagnosis of primary brain tumour, with 23.3% (n = 7) women, and 76.7% (n = 23) men, and a mean age of 49 (SD ± 13). Gliobastoma was the most common diagnosis with 58.6% (n = 17) followed by high-grade oligodendroglioma 27.6% (n = 8). Mean time between referral and tissue biopsy was 27.6 days (SD ± 27.3), with 60% of patients operated within 21 days. The proportion of patients having an MDT review prior to surgery was 73% (n = 22) with 27% (n = 8) assessed after diagnostic surgery. There was no significant difference between the sequence of MDT assessment and diagnostic surgery in relation to the grade of tumour diagnosed.

Conclusions: Our conclusions are two-fold: 1) The newly implemented CCP system is an effective performance auditing tool and 2) our experience of assessment and management of referrals could be improved with the implementation of simple measures. Further monitoring is in place to assess the effectiveness of these quality-enhancing measures. A wider assessment of the impact of our MDT on long term outcome of neuro-oncology referrals is ongoing.

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TPM1-5: Experiences and Perceptions of Simulation in Neurosurgery

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Objectives: Simulation is emerging as a crucial adjunct to surgical training. We aimed to survey experiences and perspectives of simulation in British neurosurgical practice.

Methods: A web-based survey canvassing experiences of and attitudes towards neurosurgical simulation was distributed to members of the Society of British Neurological Surgeons (SBNS) and British Neurosurgical Trainees Association. (Approved by SBNS Research Committee).

Results: 104 members responded; 51.5% consultants, 48.5% trainees. 67% judged availability of simulation training in neurosurgery to be poor compared to other specialties, and few (13%) reported having access to neurosurgical simulation tools within their department. Many had received operative training in cadavers (78%) and non biological models (40%) principally at isolated teaching events (85%). Experience was mainly focused on spinal, endoscopic and skull base surgery. Only 13% had used computer based simulation. Respondents recognised its potential to facilitate the development of 3D neuroanatomical knowledge (82%), develop new skills (75%), and as a pre-operative warm-up (58%). Poor availability (82%), expense (73%) and time constraints (50%) were perceived as limitations to integrating simulation into neurosurgical practice. However, 70% felt simulation had an important role in training and should be included in the current curriculum (66%).

Conclusions: Despite an apparent lack of accessibility, recognition exists amongst the British neurosurgical community that simulation has an important role to play in the specialty both now and in the future. A future challenge involves widening access to existing simulation tools, to increase the frequency of their use, as well as developing and validating further effective models.

TPM1-6: The novel use of endoscopic CUSA in the treatment of aqueduct tumour

R. Kumar, M. Trivedi, J. Goodden & P. Chumas (Leeds General Infirmary, Leeds, UK)

Objectives: To use CUSA via an endoscope and the aid of image guidance for debulking of an aqueduct tumour.

Design: Tumours of the Aqueduct of Sylvius are rare. This case highlights the challenges involved in the diagnosis and the novel use of endoscopic CUSA in the resection of an aqueduct tumour.

Subjects: A 31 year old lady presented with 6 month history of headaches and 2 month history of blurred vision with papillodema. Initial MRI showed triventricular hydrocephalus. However, no tumour was diagnosed at this stage. A third ventriculostomy was performed. Post-operative MRI CISS sequence demonstrated a tumour of the aqueduct. Endoscopic biopsy was subsequently performed. The initial biopsy was an ependymoma. A third operation was performed.

Methods: A standard burr hole was performed after planning with image guidance. A rigid endoscope was then registered and navigated to the aqueduct. CUSA was then introduced through the endoscope and debulking of the tumour was performed.

Results: Post-operative MRI scan confirmed gross total resection of the tumour. The final histology was of a glioneuronal tumour WHO grade 1. Post-operatively the patient had a partial fourth nerve palsy. This is gradually improving.

Conclusions: Tumours of the Aqueduct are rare. Imaging in this region can be difficult. However with the use of image guidance, endoscope and CUSA, these tumours can be safely resected.

TPM1-7: Hartshill Frame Fixation For Posterior Spinal Stabilisation: A Simple Technique In The Era Of Pedicle Screw Rod Fixation

A. A. Razzaq, D. Hajra, M. Iqbal, A. Ray, A. P. Golash & C.H. Davis (Royal Preston Hospital, Preston, UK)

Objectives: To present a case series of posterior spinal fixation, by Hartshill frame and sub-laminar wiring, in debilitated or elderly patients.
Design: Retrospective case series.
Subjects: Cases of Hartshill frame fixation were identified from 1st January 2009 to 30th April 2011, using medical records.
Methods: Twenty four patients underwent this procedure. Patients were interviewed by telephone. Pre-op and current Oswestry Disability and VAS (10 point) scores were recorded for 12 out of these twenty four patients. Four patients had expired and the rest were not contactable.
Results: The diagnosis was myeloma (n = 1), facet fracture (n = 1), osteomyelitis/discitis (n = 3) and metastatic tumour (n = 19). Mean age was 67 years and mean follow-up was 16 months. Mean improvements in ODI and VAS scores were 43% and 6 points respectively.
Conclusions: Hartshill frame may be a feasible alternative to pedicle screw fixation in patients with short life expectancy and deserves further prospective evaluation.

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TPM1-8: Follow up imaging for pituitary tumours: are we optimising our management strategy?

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Objectives: To investigate the effectiveness of routine post-operative imaging in pituitary tumour patients in eliciting tumour recurrence. To correlate the rate of clinical recurrence with those diagnosed through imaging.
Design: Retrospective review of single centre, single surgeon case series.
Subjects: 150 consecutive patients presenting with pituitary tumours over 8 years between June 2002 and December 2008. 62 patients were male, age range at time of first operation 17–86.
Methods: Theatre logbooks and a clinical information system were used to obtain information on primary histological diagnosis, presentation mode, post-operative imaging information and mode of recurrence presentation.
Results: 150 patients were included with a mean follow up period of 44 months. 119 patients had at least one postoperative scan. 17 patients had asymptomatic recurrence within an average of 10 months. On the other hand, 8 patients had clinically apparent recurrence within an average of 24 months post first surgery. Redo surgery was performed 21 times. 4 patients had more than 2 operations. There was no correlation between redo surgery and histological diagnosis.
Conclusions: Post-operative surveillance imaging is an integral component in the management of pituitary tumours. More detailed studies over a longer period are recommended to formulate stringent guidelines for post-operative imaging criteria including time scale between scans.

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TPM1-9: Medium term outcome after decompressive craniectomy for traumatic brain injury using the Glasgow Outcome Score

G. Dobson, S. R. M. Qadri, J. Ellenbogen & A. Brodbelt (Walton Centre for Neurology and Neurosurgery, Liverpool)

Objectives: We retrospectively evaluated patient outcome following decompressive craniectomy for Traumatic brain injury in our unit.
Design: Retrospective study of patients undergoing decompressive craniectomy for Traumatic brain injury.
Subjects: All patients opearted for decompressive craniectomy for traumatic brain injury between 2008–2011 with >6 month follow up.
Methods: 23 patients with a mean age of 37 years (range 17–61 years) were operated for DC after TBI over a 3-year period (2008–2011). All patients had an intracranial monitor inserted. 20/23 patients were initially managed medically while 3/23 had immediate surgery. Outcome scores were available as Glasgow Outcome Score (GOS) at time of discharge, at 3 months, 3–6 months and >6 months post-DC.
Results: The average interval between initial ICP measurement and DC was 2.39 days (range 0–5 days).The mean ICP at decision to operate was 31.9 mmHg. 5/23 patients did not have a verified GOS while 2/23 died (mortality rate of 8.69%).
7/13 patients with a GOS of 3 at discharge improved to a score of 4–5 in 6 months. After 6 months 11/15 patients with >6 month follow-up (73.33%) had a recorded GOS of 4–5.

Of 7/16 patients with a pre-operative ICP of =>30 mmHg, 4/7 (57.14%) had a GOS of 4–5 at 6 months post surgery. Of 9/16 patients with an ICP of 20–30 mmHg, 7/9 (77.77%) had a GOS of 4–5 at 6 months. Only 2 patients improved their GOS after 3 months.

Conclusions: Patients with an ICP of 20–30 mmHg at the time of DC may have a better long term prognosis. Long term functional outcome may be better than the initial discharge outcome suggests.

References:

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Trauma Head/Spine

FAM1-1: Chronic Subdural Heamatomas as major presentations of Head Injuries in Malta

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Objectives: To assess and understand the pattern of head injuries in Malta in order to improve the service provided by the only public hospital in the country.

Design: Retrospective analysis of all the acute neurosurgical admissions over a period of two years to separately analyse the pattern of head injuries using the following parameters: age, mechanism of injury, neurological assessment, CT scan findings and subsequent management.

Subjects: All the acute neurosurgical admissions to the only public hospital in the country. These also included patients admitted through A&E department, neurology service and general medical referrals.

Methods: Patient data was collected, anonymised and analysed after obtaining consent from the hospital ethical and audit committee. The pattern of head injuries was studied, age and sex distribution, initial GCS, CT scan findings and subsequent management including outcome were recorded using Excel spreadsheet.

Results: A total of 109 head injury patients were admitted to the neurosurgical unit. Over 46% (50 patients) of the patients were over 65 years of age. Falls were the most common mechanism of injury comprising 67% (74 patients) of the patients. Chronic subdural heamatoma was found in 33 patients over the age of 65 compared to acute extradural, subdural haematomas, depressed fractures and closed head injuries were more common in the younger age group.

Conclusions: The average age of maltese men and women is now rising. In addition, a big number of british expatriates are retiring in Malta who are entitled for the state health care. Even trivial injuries in these patients can result in a chronic subdural haematoma. This is further aggravated by the fact that most of these patients are on aspirin, warfarin or other medications. This is utilizing immense resources of the health services. Following our study awareness campaigns for fall prevention have been started by the care of the elderly physicians. We will also compare the pattern of head injuries in Malta with other developed countries in western Europe highlighting the significant difference.

FAM1-2: Incidence and Aetiology of Low Brain Extracellular Glucose Following Traumatic Brain Injury

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Objectives: Low brain extracellular glucose concentration has been associated with poor outcome following traumatic brain injury (TBI). The aim of this study was to explore the incidence of low glucose in a large sample of TBI patients and attempt to differentiate the underlying causes.

Design: Retrospective analysis of prospectively collected data.

Subjects: Consecutive patients admitted to neurointensive care with TBI requiring invasive intracranial monitoring.

Methods: Cerebral extracellular chemistry was monitored using microdialysis catheters inserted via a cranial access device and sampled hourly. Patients were managed according to a standard CPP and ICP targeted protocol. The threshold for low brain glucose was set at <0.5mmol/L. Normal extracellular concentrations of pyruvate and lactate were defined as >125 microm/L and <4 mmol/L, respectively and lactate/pyruvate ratio (LPR) <25 was considered normal.

Results: From 223 patients there were 22705 microdialysis samples analysed. Overall, 54 patients (24.2%) had at least one episode of low brain tissue glucose. LPR during periods of low glucose was highly variable (mean+/−SD: 30.3+/− 30.7) and within the normal range in 43% of samples. During 31% of periods of low brain glucose the extracellular pyruvate level was within the normal range and was associated with high lactate, together suggestive of hyperglycolysis. In contrast, in the 69% of periods when pyruvate was low, mean lactate was within the normal range but LPR was elevated indicating ischaemia and impaired substrate delivery.

Conclusions: Low brain extracellular glucose is common following TBI and may be a reflection of hyperglycolysis or local ischaemia, which can be distinguished by the relative concentrations of other energy metabolites.

FAM1-3: Decompressive craniectomy in Traumatic Brain Injury: RESCUEicp in the wake of the DECRA results

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Objectives: The DECRA trial [early decompressive craniectomy (DC) vs advanced medical management;] recruited 155 TBI patients from 2002 to 2010 (1). Even though DC was effective in reducing ICP, it was associated with a significantly higher risk of unfavourable outcome at 6 months (odds ratio 2.21; 95% CI: 1.14 to 4.26; $p = 0.02$). We aim to highlight the differences between DECRA and the ongoing RESCUEicp trial [protocol-driven DC vs barbiturates; (2)].
Design: Both DECRA and RESCUEicp are randomised trials.
Subjects: RESCUEicp has recruited more than 300 patients (planned total of 400).
Methods: We also aim to provide an update on RESCUEicp recruitment and present the baseline characteristics of the first 246 patients.
Results: The mean age of DC group is 31.4 years (95% CI: 28.9–33.8) and that of the medical group is 35.9 years (33.3–38.4). Median pre-intubation GCS was 7 in both groups. Overall, 31% of patients had a GCS > 8. Pupillary abnormalities were present in 16% of patients in DC group and 21% of patients in the medical group. Intra-axial mass lesions were present in 23% of patients in DC group and 29% of patients in the medical group.

The key differences between RESCUEicp and DECRA are: ICP threshold (25mmHg vs 20mmHg), duration of refractory intracranial hypertension (1 hour vs 15 minutes), timing of randomisation (any time when inclusion criteria are met vs within first 72 hours only), acceptance of intra-axial mass lesions (RESCUEicp only) and longer follow up (2 years in RESCUEicp).
Conclusions: DECRA and RESCUEicp have different cohort profiles and inclusion criteria. Hence the results from the DECRA study should not deter recruitment into RESCUEicp. On the other hand, the DECRA results emphasize the fact that DC remains an unproven therapy, which should ideally be undertaken in the context of randomised trials.

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FAM1-4: Advanced Magnetic Resonance Imaging and Brain Injury in University Amateur Boxers

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Objectives: The safety of amateur and professional boxing is a contentious issue. We hypothesised that advanced magnetic resonance imaging may provide insight into sub-clinical brain injury in a cohort of amateur boxers taking up the sport for the first time.
Design: Prospective cohort study.
Subjects: Boxers were recruited from a university amateur boxing club.
Methods: Magnetic resonance imaging was performed prior to starting training, after the first major competition (at approximately three months), and at one year subsequently. Sequences included structural images (T1, T2, FLAIR and GRE) as well as diffusion and proton spectroscopy.
Results: A total of 30 boxers were recruited: 19 had post-fight scans and 11 had one year follow-up scans. Structural imaging revealed two incidental abnormalities. Spectroscopic imaging was inconsistent but didn't detect a significant overall change in n-acetylaspartate or choline ratios between scans ($p > 0.05$). Voxel based morphometry noted a region of increased T1 signal in the posterior left insula white matter over time in the whole group ($p < 0.01$). During the study period one boxer developed seizures whilst another developed a chronic subdural haematoma requiring burr hole drainage.
Conclusions: Standard structural magnetic resonance imaging does not reveal sub-clinical brain injury in young university amateur boxers. It remains to be seen if diffusion weighted imaging or voxel based morphometry are more sensitive to detecting changes. The possibility exists that the stringent regulations enforced by the amateur boxing authorities enables the majority of participants to partake in the sport with no demonstrable early risk of brain injury.

FAM1-5: Outcome of Cranioplasty after decompressive craniectomy for traumatic brain injury

S. R. M. Qadri, G. Dobson, J. Ellenbogen & A. Brodbelt (Walton Centre for Neurology and Neurosurgery, Liverpool, United Kingdom)

Objectives: Decompressive Craniectomy (DC) after traumatic brain injury (TBI) for persistently raised intracranial pressure is a common procedure in neurosurgical practice. Cranioplasty is usually required to protect the brain and for cosmesis. The timing of cranioplasty in the post operative period is controversial with 6 months after craniectomy being an accepted practice. We have retrospectively reviewed the practice of cranioplasty after DC for TBI in our unit.
Design: Retrospective review.
Subjects: 23 patients with decompressive craniectomy after TBI in the period from Jan 2008-Jan 2011 were retrospectively reviewed. 2 patients had died in the post operative period while records were available in only 15 patients.
Methods: 23 patients with decompressive craniectomy after TBI in the period from Jan 2008-Jan 2011 were retrospectively reviewed. 2 patients had died in the post operative period while records were available in only 15 patients. 13/15 patients had long term follow-up. The time to cranioplasty was noted. The Glasgow outcome score (GOS)before and on follow-up after cranioplasty were noted.
Results: The mean time to cranioplasty in our series was 29.49 weeks (range 1.42–82 weeks). Cranioplasty within 6 months of the DC was done in 6/15(40%) patients and after 6 months in 9/15 patients (60%). The overall complication rate was 20% and included wound infection and extra-axial fluid collections. All the complication were in patients operated <6 months after DC. The GOS improved in 2/6 (33.33%) patients who had cranioplasty within 6 months. Cranioplasty after 6 months resulted in an improvement in GOS in 2/9 (22.22%) patients.
Conclusions: An improvement in the functional outcome can be seen with cranioplasty after DC for TBI .However, there is a higher complication rate if done within 6 months. The timing of cranioplasty has to be balanced to take advantage of both these factors to ensure good patient outcome.

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2. De Luca GP, Volpin L, Fornezza U, Cervellini P, Zanusso M, Casentini L, *et al*. The role of decompressive craniectomy in the treatment of uncontrollable post-traumatic intracranial hypertension. *Acta Neurochir Suppl* 76:401–404, 2000.

FAM1-6: Head Injury – the size of the problem: A study of reporting systems

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Objectives: To examine the completeness of data on admission with Head Injury at a Regional Neuroscience Centre.
Design: A comparative study using retrospective and prospective data sources.
Subjects: All adults admitted to all specialties with all severities of head injury.
Methods: Adult admissions with 'head injury' in a single month were identified from 2 sources: a) prospective ED reports using ED codes for head injury + site 'Head/Face' and 'Reason for attendance' b) retrospective ICD-10 coding reports of codes S00–09. Data from both sources were compared and reasons for non-capture analysed. Admissions from both reports were combined to obtain the true number of admissions with Head Injury.
Results: A total of 112 admissions with Head Injury were identified from both sources. Completeness from ED reports was 70% ($n=78$) and 83% ($n=93$) from ICD-10 reports. 53% ($n=59$) of admissions were captured in both reports. The main reasons for non-capture in the ED reports were non-coding of head injury (56%), and admission via another routes, e.g. transfers (44%). The main reason for non-capture in the ICD-10 reports were non-coding of head injury or not the primary diagnosis (74%).
Conclusions: Reliable epidemiological data is required for planning and commissioning services, however identification of Head Injury admissions is difficult due to ambiguity of terminology and patient population.[1] More than one data source is necessary for completeness of data, however data issues such as comprehensiveness, reliability and inclusion criteria/ possible bias need to be considered.[2]

References:

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FAM1-7: Outcome following acute subdural haematoma surgery: predicted versus observed for patients undergoing craniotomy or decompressive craniectomy

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Objectives: We reviewed a series of consecutive patients undergoing craniotomy or decompressive

craniectomy for traumatic acute subdural haematoma (ASDH), comparing observed outcome with that predicted by the CRASH prognostic model.
Design: Retrospective single-centre study.
Subjects: Patients undergoing evacuation of traumatic ASDH from December 2006 to December 2009.
Methods: Patients were identified from operating theatre registers. Data were extracted from patient records and departmental databases. The CRASH-CT prognostic model, an indicator of injury severity, was used to calculate predicted risks of 14-day mortality and poor outcome at 6 months.
Results: 68 patients were identified (median age 49 years, 63% male). Pre-intubation GCS was <9 in 56%, 9–12 in 22% and >12 in 22% of patients. Primary evacuation of the ASDH was by craniotomy (CR) in 53% and decompressive craniectomy (DC) in 47% of patients. Favourable outcome (GOS 4 – 5 at 6 months) was achieved in 50% of CR and 32% of DC patients ($p = 0.14$). Mortality rate was 25% for the CR vs 40% for the DC group ($p = 0.29$).

The mean CRASH predicted risk of mortality was 18.2% for the CR group vs 39.8% for the DC group ($p = 0.015$). The mean risk of poor outcome was 66.6% for the CR group vs 77.4% for the DC group ($p = 0.028$). The standardised mortality ratio (observed/expected deaths) was 0.41 (95% CI: 0.11–1.04) for CR and 0.63 (0.29–1.2) for DC. The standardised morbidity ratio (observed/expected unfavourable outcomes) was 0.78 (0.45–1.27) for CR and 0.95 (0.59–1.43) for DC.
Conclusions: Decompressive craniectomy and craniotomy for ASDH have comparable outcomes after accounting for injury severity. Class I evidence is required in order to refine the indications for DC following evacuation of ASDH.

FAM1-8: STITCH(Trauma): The first International Randomised Trial for patients with Traumatic ICH

A. D. Mendelow, E. N. Rowan, B. A. Gregson, R. Francis, P. Mitchell, on behalf of the STITCH (TRAUMA) Principal Investigators (Neurosurgical Trials Unit, Newcastle upon Tyne, UK)

Objectives: There are no clear guidelines for the treatment of patients suffering from traumatic intracerebral haemorrhage (TICH) and contusion. Currently treatment practices vary considerably throughout the world and there have been no international randomised trials to further knowledge on this subject. STITCH(Trauma) will provide evidence about the efficacy of early surgery for the treatment of TICH and contusion compared to initial conservative treatment.
Design: This randomised parallel group trial is funded by UK NIHR HTA. The target for recruitment is 840 patients by end March 2013.
Subjects: Adult head injury patients are eligible if they:

- Have CT evidence of 1 or 2 TICHs/contusions >10ml.
- Are within 48 hours of head injury.
- Demonstrate clinical equipoise in the opinion of their neurosurgeon.

Methods: Patients are randomised to early surgery or initial conservative treatment. Early surgery patients receive an operation within 12 hours of randomisation. Outcome is measured at 3 (UK only), 6 and 12 months by postal questionnaire.
Results: The trial protocol has been received with enthusiasm by 105 interested centres worldwide. On 17/05/2011, 37 sites were fully registered and 68 patients recruited. Updated information will be presented at the meeting.
Conclusions: Recruitment is increasing steadily and new sites are encouraged to establish patient screening routines and should aim to recruit 3 patients per year. UK sites are especially encouraged to join the trial to ensure the success of the health economics component of the study. The trial coordinators will support sites with obtaining regulatory approval. Contact the trial team at: trauma.stitch@ncl.ac.uk or http://research.ncl.ac.uk/trauma.STITCH/.

FAM1-9: Autologous Cranioplasty Following Decompressive Craniectomy - A Retrospective Audit Of A Single Units Three Year Experience

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Objectives: Decompressive craniotomy (DC) for traumatic brain injury (TBI) is often used to treat diffuse swelling and control ICP. It is accepted that the bone flap should be removed. There are several options for reconstruction. We routinely perform autologous cranioplasty (AC), and we have not found any evidence previously published on the success or otherwise of AC after trauma.
Design: Retrospective audit.
Subjects: Patients requiring DC for TBI.
Methods: Cases were identified using the unit Head Injury database. Operative notes and electronic records were then reviewed.
Results: Over 3 years 54 DC's were performed for TBI and followed up for 9 months (6–12 95% CI) (41 male: 13 female, mean age 37 (32–41)). 44 of those cases underwent AC (5 titanium mesh, 2 combination reconstruction and 3 did not survive to cranioplasty). Mean time from craniotomy to cranioplasty was 99 days (71–126 95% CI). Complications severe enough to warrant re-admission were found in 10 cases(18%) and of which 6(11%)

needed surgical intervention. No statistically significant predictor of poor outcome from cranioplasty was detected.
Conclusions: AC has many advantages including avoiding the use of expensive prosthetic materials compared to other methods of reconstruction. Our complication rate is similar or better compared to published data using other methods.

Paediatric

FAM2-1: ''To Be or Not to Be?'' The Relationship between the Clinicopathological Diagnosis and Neuroimaging in the Identification of Focal Cortical Dysplasia Type IIB

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Objectives: Focal cortical dysplasia (FCD) is a localised derangement of cortical organisation and is associated with medical-refractory epilepsy in children. Recently, the ILEA Diagnostic Methods Committee proposed an international consensus to improve the clinicopathological diagnosis in FCDs. In this study, the role of this novel histopathological classification system coupled with pre-operative MRI imaging has been evaluated.
Design: A six-year retrospective study of 24 children (<17 years of age) with histologically confirmed FCD Type IIB following surgical resection for epilepsy was conducted.
Subjects: All patients had epilepsy protocol brain MRI including 3D T1 and 3D FLAIR volumetric sequences.
Methods: Analysis was performed by review of medical notes, electronic databases, neuropathological slides and neuroimaging. MRI scans were evaluated based on a ''seven point'' classification scheme.
Results: During January 2005-April 2011, 62 children with histologically confirmed FCD underwent neurosurgery. 24 patients met the diagnostic criteria of FCD Type IIB. According to our classification, neuroimaging demonstrated subcortical white matter signal change (100%); well-defined margins (87.5%); blurring of gray-white matter junction, abnormal cortical gyration/sulcation with single lobe involvement (83.3%); ''transmantle sign'' (70.1%), and apparent cortical thickening (54.2%). Signal intensities on T2- and T1-weighted images were variable (42% hyperintense on T2W and hypointense on T1W images, 33% hypointense on T2W and T1W sequences).
Conclusions: Characteristic features of FCD Type IIB were seen in the majority, but not in all patients. Patient selection and complete surgical resection improves long-term outcomes in patients with FCD Type IIB. It is important to identify positive clinical and radiological characteristics to stratify patients prior to surgery to aid in their overall treatment.

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FAM2-2: Craniovertebral stabilisation in children less than 5 years old:Limitations, Options and Outcomes

T. Elais, N. Haliasos & D. Thompson (Great Ormond Street Hospital for Children)

Objectives: In young children with craniovertebral instability, deformity or neuraxial compression, the treatment options are limited due to the combination of skeletal immaturity and small size particularly in the context of bone dysplasias.This study examines the clinical effectiveness of craniovertebral stabilisation procedures in children less than 5 years of age.
Design: Retrospective analysis of all children less than 5 years of age who underwent posterior fusion at the craniovertebral junction.
Subjects: The study included 15 children who underwent the procedure between 1997 and 2011.
Methods: We reviewed the medical records including age at surgery, sex, aetiology, operative procedure, complications, follow up, and the outcome.
Results: The median age at surgery was 27 months (range 9 to 45 months), with mean followup of 3.5 years. The underlying diagnosis was mucopolysaccharidosis (n = 4), spondyloepiphyseal dysplasia (n = 3), congenital AAD (n = 2), Down's syndrome (n = 1), Marfan's syndrome predisposing to AARF (n = 1), and AARF with os odontoideum. (n = 1). Three children had acquired lesions: 1 each for trauma, neoplasm and infection. Operations included 12 occipitocervical and 3 atlantoaxial fixations. All comprised of a combination of sublaminar wires and autologous bone graft, except 1 which had rigid occiput to lateral mass fixation; and all patients were immobilised postoperatively in a halo orthoses for 3 months. 12 children demonstrated radiological and clinical evidence of fusion. Two patients needed revision operations for initial non-fusion. One child died at 1 month due to systemic sepsis unrelated to surgery. One child developed an ischaemic injury to the spinal cord 24hrs post op resulting in paraplegia. All the other children were mobile either independently (n = 12) or with support (n = 1).
Conclusions: Posterior cervical fixation can be performed effectively in very young children, and morbidity is largely related to neurological disability

at presentation. An algorithm of management is presented for this group of children.

FAM2-3: The utility of serial PCR assay in the surgical management of Pneumococcal intracranial sepsis

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Objectives: Aspirated intracranial fluid, in the surgical management of intracranial sepsis, may not culture an organism due to the previous administration of antibiotics. We have sought to utilise Polymerase Chain Reaction (PCR) to determine the cause of culture-negative sepsis and in monitoring response to therapy.
Design: Retrospective review of 5 cases of Streptococcal pneumoniae intracranial sepsis.
Subjects: n = 5.
Methods: Samples were analysed using real-time quantitative PCR targeting the pneumococcal lytA gene and the number of genome copies per mililitre of sample determined.
Results: Streptococcus pneumoniae sepsis was diagnosed by PCR in five culture-negative cases comprising: ventriculitis (x3), subdural empyema and meningitis. Serial serum inflammatory markers (CRP and WBC) and number of genome copies were graphically plotted over the duration of inpatient stay for cases requiring surgical drainage of recurrent collections or external ventricular drainage. A correlation was demonstrated between change in bacterial load and serum inflammatory markers, reflecting similar changes in clinical state.
Conclusions: This is the first report of the use of serial quantitative PCR in monitoring the course of intracranial sepsis secondary to Streptococcus pneumoniae. Further work is required to determine the precise relationship between serum inflammatory markers, clinical state and bacterial load: do changes in one precede the other? Furthermore, a threshold value for number of genome copies in CSF/aspirate samples has yet to be defined.

FAM2-4: Review of Practices in Myelomeningocoele Repair

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Objectives: 1. To investigate the incidence of myelomeningocoele over the past 5 years at our institute with reference to ethnicity and religious practices. 2. To review our practices in myelomeningocoele repairs undertaken at our institute with reference to timing, complications and ventriculo-peritoneal shunt placement. 3. To quantify the associated abnormalities with our myelomeningocole population. Comparison with internationally quoted incidences.
Design: Retrospective observational review of current practice.
Subjects: Inclusion criteria: 26 neonates (16 Female, 10 Male) that underwent myelomeningocoele repair at our institution from May 2006 until April 2011.
Methods: The incidence of myelomeningocoele in the trust catchment area was calculated over the past 5 years with respect to live births at the institute.

From May 2006 until April 2011, a retrospective collection of myelomeningocoele surgeries at our institute was collected from theatre logs, the Electronic Patient Records System and clinical paper notes. Documented parameters included: a) rates of wound dehiscence subsequent to myelomeningocoele repair, b) wound infection and sepsis post-repair, c) incidence and timing of VP shunting post-repair, d) incidence and timing of VP shunt infection, e) urinary, orthopaedic and limb motor deficits in each patient.
Results: The incidence of myelomeningocoele with respect to live births at our institute in 2006/7 was 0.09%, in 2007/8 was 0.08%, in 2008/9 was 0.12%, in 2009/10 was 0.07% and in 2010/11 was 0.16%.

19 of the 26 cases were British Caucasian (73%), 6 were Afro-Caribbean (23%) and 1 patient was Eastern European (4%). This discounts the cause of increased rates to be due to immigrant populations.

Myelomeningocoele repair was conducted a median average of 1 day post-delivery (n = 26, interquartile range = 0.5). Postoperative complications of wound dehiscence occurred in 7.69% with the same developing sepsis. Functional deficits found in patients were broken down into urinary system deficits (35%), orthopaedic deficits (31%) and limb motor deficits (27%).

VP shunt placement post-repair was required in 73% of cases due to hydrocephalus. Shunting was performed at a mean of 13.21 ± 3.11days post-repair. Out of 19 shunted patients, 1 patient (5.26%) developed a shunt infection.
Conclusions: The overall incidence of myelomeningocoele has declined over the last two decades. However, the incidence in our trust catchment area has shown a nearly two-fold increase between 2006/7 (0.9 per 1000 live births) and 2010/11 (1.6 per 1000 live births). All patients during this period underwent antenatal counselling and were advised about folic acid use. Of the total 26 patients, 5 (19%) had declared religious beliefs that opposed termination, though these pregnancies occurred throughout the 5 years and do not account for the recent increase in myelomeningocoele.

The 2011 Management of Myelomeningocele (MOMS) randomised control trial [1] reports defined outcomes for traditional postnatal myelomeningocoele repair. Reported rates of wound dehiscence at the repair site in the MOMS trial (n = 80) was 6.25%; whereas our rates (n = 26) were comparable at 7.69%. Rates of sepsis in our cohort was

7.69% compared to 1.25% reported in the MOMS study. The MOMS reported rates of VP shunting after 12 months of repair to be 82% (n = 80), whereas at 12 months in our institute (n = 25), shunt rates were 76%. Of those patients receiving a shunt at our institute (n = 19), shunt infection was present in 5.26%, compared to 10.61% (n = 66) in the MOMS.

We report an increase in incidence of myelomeningocoele in our institutional catchment area over the last 5 years, despite appropriate antenatal guidance and prenatal diagnosis in place. We can further report lower rates of shunting after myelomeningocoele repair as well as lower rates of VP shunt infections. Rates of wound leak in both studies are comparable though wound infection rates at our institute are higher than those reported in the MOMS.

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FAM2-5: Paediatric Craniopharyngiomas: A comparison of open transcranial surgery V's minimally invasive surgery- reflecting a change in treatment paradigm

K. Sweeney, D. Crimmins, J. Caird, T. Sattar & D. Allcutt (Beaumont Hospital, Dublin, Ireland)

Objectives: Infamous for their recurrence rates, these lesions cause symptoms across five measurable axes: Neurologic, Pituitary, Visual, Hypothalamic and Educational. This is reflected in the Craniopharyngioma Clinical Status Scale (CCSS). To compare preoperative, immediate postoperative and last follow up scores of paediatric patients diagnosed with a craniopharygioma who either underwent open transcranial (TC) or minimally invasive(MI) surgery (endoscopic fenestration or stereotactic placement of reservoir).
Design: Retrospective cohort study.
Subjects: Paediatric craniopharyngiomas diagnosed 2005–2010.
Methods: A review of medical records and imaging to correlate symptoms at presentation with that of imaging. We calculated CCSS scores at three study time points for each surgical group noting the change (?) from the preoperative score.
Results: 15 identified. 13 had symptoms due to the cystic component. 7 underwent open transcranial surgery off which 4 went onto have MI procedures. 8 had MI procedures only. The TC group had deterioration in the immediate postoperative visual (? 0.1) and pituitary (? 0.6) scores and by last follow up there was a deterioration in all five axes (?N = 0.3, ?V = 0.3, ?P = 1, ?H = 0.1, ?E = 0.5). Median follow up 3.1 years. The MI group had deterioration in the immediate postoperative pituitary (? 0.1) score only and by last follow up there was a deterioration in only 2 axes (?V = 0.3, ?P = 0.6). Median follow up 1 year.
Conclusions: At our institution choice of surgical approach is guided by that part of the lesion causing symptoms. Therefore the more commonly occurring symptomatic cystic component is managed by MI surgery followed by XRT/PBT. Early results in the MI group are promising however longterm comparisons are necessary.

FAM2-6: Ventriculosubgaleal shunts: A retrospective observational study

A. Ghosh, C. J. Wedderburn & S. Bassi (Kings College Hospital, London, UK)

Objectives: To observe the outcomes of preterm infants who underwent ventriculosubgaleal (VSG) shunting in order to evaluate the procedure as a treatment option for post haemorrhagic hydrocephalus.
Design: A retrospective observational study.
Subjects: All preterm infants with post haemorrhagic hydrocephalus, who underwent Ventriculosubgaleal (VSG) shunting between 2007 and 2011 at Kings College Hospital.
Methods: Data was collected on all preterm infants with post haemorrhagic hydrocephalus who underwent VSG shunting between 2007 and 2011. The data collected included CSF results, duration between insertion of VSG shunt and Ventriculoperitoneal (VP) shunt, requirement for VP shunt and complications.
Results: We present a series of 8 patients who underwent VSG shunting between 2007 and 2011. 2 of the 8 patients did not require VP shunting or any further treatment.
Conclusions: We conclude that Ventriculosubgaleal shunts are an effective means of treating posthaemorrhagic hydrocephalus in preterm infants.

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FAM2-7: Can we diagnose Brain Tumours in Children Earlier? An Irish Audit

C. Purcell[1], A. Qassim[1], D. Alcutt[1], T. Sattar[1], D. Crimmins[2], A. J. Nicholson[1] & J. Caird[2] (Departments of Neurosurgery and General Paediatrics, Children's University Hospital, Dublin[1], Republic of Ireland)

Objectives: To review the presenting symptoms and their duration in Irish children subsequently diagnosed as having a brain tumour and to assess whether we might be able to ensure earlier diagnosis.

Design: A Retrospective Audit.
Subjects: All children diagnosed with Primary Brain Tumours in the Republic of Ireland between 2009 and 2010 inclusive.
Methods: An extensive review of discharge summaries, neurosurgical and neuro-oncology databases of all children admitted with a diagnosis of brain tumour was undertaken focusing on the range of symptoms, speed of investigations, histological findings and subsequent prognosis. Data for 2009 and 2010 has been analyzed using an Excel spreadsheet.
Results: Of 64 children diagnosed with a primary brain tumour, 33 were female and the mean age at presentation was 7.1 years (+/− 4.5 years). Presenting symptoms included headache (47%), vomiting (42%), visual disturbance (31%), ataxia (22%) and limb weakness (11%). The mean duration of symptoms prior to hospital attendance was 17.6 weeks (range 1 day to 156 weeks) and mean time to scan was 11.8 days (+/− 22.7 days). 37 children (58%) had infratentorial brain tumours. 6 children with craniopharyngioma, the mean time to diagnosis was 21.8 weeks (+/−24.4 weeks). Astrocytomas (41%) and Primitive Neuroectodermal Tumours (20%) were the most common brain tumours. 4 asymptomatic children were diagnosed due to surveillance imaging for neurofibromatosis or after routine school eye examination. Behavioural change was the unifying symptom in the 3 patients with the longest time to hospital presentation (mean 130 weeks).
Conclusions: Greater parental and primary care awareness of red flag symptoms and the need for re-assessment are key to earlier diagnosis.

FAM2-8: Chiari II Malformation- A correlation between anatomical characteristics and clinical symptoms and outcomes

K. Sweeney, D. Crimmins, J. Caird, T. Sattar & D. Allcutt (Beaumont Hospital, Dublin, Ireland)

Objectives: Chiari II malformation (C2M) is uniquely associated with the spinal dysraphic condition myelomeningocele. It accounts for more deaths before the age of 2 years than any other cause. Many theories on its aetiology have been proposed. Its management remains controversial. We investigated the relationship between anatomical features on MRI with clinical symptoms and indications for foramen magnum decompression (FMD).
Design: Retrospective cohort study.
Subjects: Over a 25 month study period all myelomennigoceles with a perioperative MRI of brain and spine were included.
Methods: Medical record and imaging where reviewed. The collected data was analysed with a linear regression model and scatter plot to assess for correlations.
Results: 35 identified. 2 excluded. All required a VP shunt. 19 had triventricular hydrocephalus, 14 had lateral ventricular dilation or colpocephaly. 4 had symptoms attributed to C2M of which 2 had a FMD due to severe bulbar dysfunction. No significant relationship exists between tonsil ectopia, medullary kink or foramen magnum AP diameter and clinical symptoms of C2M or indications for FMD. There was a statistically significant association between tonsilar ectopia and level of lesion (p-value = 0.0003, CI 95%).
Conclusions: Hydrocephalus compounds symptoms of C2M. Bulbar symptoms associated with Chiari II malformations are due to a spectrum of both cranial nerve nucleus dysgenesis and compression/traction on the exiting cranial nerves. Hagen–Poiseuille's equation can explain the observation of why higher lesions are associated with greater tonsilar ectopia and thus confirms McLone et als Unified Theory of Chiari II malformations.

FAM2-9: Congenital Dermal Sinuses – Seek And You May Find!

A. E. Henderson, M. C. Sharp, T. Jaspan & M. Cartmill (Queens Medical Centre, Nottingham, UK)

Objectives: To highlight the importance of full clinical assessment and review of imaging in the case of dermal sinuses.
Design: Case report.
Subjects: We report the case of a 6 month old boy, who was found on routine examination to have two separate skin dimples with overlying skin changes, in the thoracic region.
Methods: Review of case history.
Results: MRI of the neuroaxis revealed dorsal dermal sinus tracts at T5/6 and T9/10 with associated posterior vertebral arch defects, a low lying conus medullaris and thickened filum terminale. These tracts were explored intra-operatively. A bifid dermal sinus tract with underlying dermoid was found at one level, and a blind ending dermal sinus tract was found at the other level. Both were excised successfully, and he remained asymptomatic.
Conclusions: Congenital dermal sinuses can occur throughout the neuroaxis, therefore a full clinical assessment and neuroaxis imaging is necessary. If an apparently solitary dermal sinus tract is identified, multiple tracts and other anomalies should be searched for. Subsequent prompt exploration should be considered, to prevent the occurrence of potentially harmful sequelae.

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Functional

WPMP1-1: Deviation of the cisternal segment of the trigeminal nerve is more predictive of symptomatic neurovascular compression than point of contact at root entry zone – A MRI study

I. Ughratdar, V. Toh, D. D'Aquino, S. Smith, G. Sivakumar & S. Basu (Queens Medical Centre, Nottingham)

Objectives: Neurovascular compression (NVC) is a common finding in patients with trigeminal neuralgia (TGN) and in asymptomatic population. NVC at the root entry zone (REZ) is believed to be crucial however patients with NVC beyond REZ had been reported. The aim of this study was to identify imaging features that can help in predicting symptomatic NVC for TGN.
Design: MRI review of anatomical relationship of the cisternal part of trigeminal nerve (TN).
Subjects: 75 asymptomatic individuals and 33 symptomatic patients with NVC on MRI, who underwent successful decompression for TGN.
Methods: Using neuronavigation console and MRI, anatomical relationship of the cisternal TN were reconstructed. Presence of NVC were identified and contact point were measured. Deviation of the nerve was categorized by published protocol. The outcome compared the point of contact and deviation between symptomatic and asymptomatic TN.
Results: 58 NVC were found on 150 asymptomatic TN (38.6%), with mean distance of contact 5.1mm (range 1.8–9.1mm) from the border of pons. Majority (87%) of these contacts produced no deviation of the nerve. Mean distance of contact in 33 symptomatic TN was 3.8mm (range 1.1–10.8) with majority (72%) of the NVC produced significant deviation of the TN. 24 patients had bilateral NVC with the asymptomatic contralateral side. In this group, only 1 patient had more deviation of the TN on the asymptomatic side compared to 7 where a more distal contact were symptomatic. Deviation was significantly greater in symptomatic nerves ($p = < 0.001$, Fisher exact).
Conclusions: Deviation of the cisternal segment of the trigeminal nerve is more predictive of symptomatic neurovascular compression than point of contact which may be beyond conventional REZ.

WPMP1-2: Correlation of quality of life and carergiver burden in carers-patients after Deep Brain Stimulation (DBS) for Parkinson's Disease (PD): one year follow up

N. Haliasos, M. J. Naushahi, G. Prezerakos, C. Fuller, V. Wykes, B. Forrow, C. Joint, C. Fletcher, T. Z. Aziz, A. L. Green, D. Nandi, A. Misbahuddin & H. L. Low (Queens University Hospital, Romford, UK)

Objectives: We assess the change in the quality of life and care burden of the carers of patients with Parkinson's disease (PD) following subthalamic nucleus (STN-DBS).
Design: Longitudinal prospective study involving three functional neurosurgical centres in the UK.
Subjects: 15 carers (3M:12F) with a mean age of 52.2y (range 32–70) were included in the study. They were main carers for 15 PD patients for an average of 12.4 years. 12 carers were partners and 3 were younger family members.
Methods: Carers of PD patients (STN-DBS) were assessed before surgery and 1 year after surgery using the SF-36, Carer Reaction assessment (CRA) and Carer Strain Index (CSI) questionnaires.
Results: Significant improvements in carer SF36 physical component scores 13.7% (PCS; $p < 0.05$) and SF36 mental component scores 14.6% (MCS; $p < 0.05$) from their pre-operative ratings a year after their partner/family member had undergone DBS for PD. Furthermore, carers report significant reductions 65.3% in caregiver burden as assessed using the CSI ($P = 0.001$). Carer ratings showed significant reductions across the five domains assessed by the CRA including family abandonment ($p = 0.003$), financial strain ($p < 0.05$), scheduling burden ($p = 0.002$), health burden ($p = 0.001$) and lack of self-esteem ($p = 0.006$) compared with their ratings one year before surgery.
Conclusions: The results suggest that this surgery is associated with a positive effect on the physical and mental well-being of carers, reduces their sense of burden and financial strain, and results in improvements to their self-esteem in accordance with the PD patient counterpart. This first study on the quality of life and carers burden can be an invaluable additional information instrument for physicians proposing and patients-carers consenting for the intervention. It also gives a strong message to the healthcare providers with regards to the positive psychosocial impact of DBS.

WPMP1-3: Ten-year outcome of Multiple Subpial Transection in the treatment of Landau-Kleffner Syndrome

R. Chelvarajah, A. Valentin, G. Alarcon, I. Malik, C. E. Polkey, R. P. Selway (Kings College Hospital, London, UK)

Objectives: Landau-Kleffner Syndrome (LKS) is an epileptogenic disease characterised by speech regression in children that classically presents in mid first decade of life. The role of surgery is currently controversial and long-term outcome is not widely reported. We present late follow-up data for seizure control, language ability and behaviour in this patient group.
Design: Case notes and contemporary telephone review.

Subjects: Eight patients suffering with LKS with 10 or more years of follow-up after Multiple Subpial Transection (MST) were identified. Ages at surgery ranged from 5 to 10. Equal number of boys and girls. Two patients were operated on twice; both for ipsilateral re-do MST. Operation (first in the case of repeat MST) ranged from 2 to 7.5 years (median 4 years) after diagnosis of LKS.
Methods: The case notes of each of these patients were studied to record age when symptoms unequivocally attributed to LKS were first noted, age at MST, outcome for seizure control, language function and behaviour, and complications of surgery.
Results: Seven of the eight patients had symptomatic improvement after MST. Two demonstrated complete recovery in all aspects and entered mainstream education. Five patients improved well with seizures limited to nocturnal and minor daytime episodes, and improved language and neuropsychological function to permit educational progress. One patient demonstrated regression 18 months after MST (performed in Chicago, USA) and re-investigation in our unit demonstrated recurrent ipsilateral peri-sylvian seizure activity but the family opted against repeat MST.
Conclusions: MST is a favourable treatment option for LKS. This review suggests benefits are sustained in the long term with little or no surgical morbidity, and challenges recent calls questioning the benefit of this treatment option.[1]

References:

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WPMP1-4: Effects of chronic subthalamic nucleus-deep brain stimulation on gaze displacement and axial mobility in whole body turning in patients with advanced Parkinson's disease

L. A. Ah-Kye, M. J. Naushahi, N. Pavese, P. G. Bain & D. Nandi (Imperial College Neuromodulation Group (ICNG))

Objectives: To determine the efficacy of chronic subthalamic nucleus (STN)-deep brain stimulation (DBS) (=6 months duration) in alleviating the axial motor symptoms of advanced Parkinson's disease (PD).
Design: Case-Control study.
Subjects: 5 patients with chronic STN-DBS and 5 advanced PD patients were both investigated whilst on regular optimal antiparkinsonian medication. 5 age-matched and 5 young subjects served as controls.
Methods: We used a neurophysiological paradigm recently developed in our laboratory in which the subject undergoes whole body turning reorientating gaze, trunk and feet towards visual targets appearing in the periphery of the visual field [1, 2]. The protocol used provided performance data for predictable and unpredictable rotations.
Results: Bilateral STN-DBS significantly decreased the number of saccades required for target acquisition ($p < 0.05$). We found reduced latencies and increased velocities across all axial motor segments but this was not statistically significant.
Conclusions: The substantial affects of STN-DBS on neural pathways involved in saccade performance may indicate a direct system that could be the contributing factor to visuo-postural control. These findings offer new insights into the way STN stimulation may improve axial motor ability in the surgical management of advanced Parkinson's disease.

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2. Anastasopoulos D, *et al.* Gaze displacement and inter-segmental coordination during large whole body voluntary rotations. *Exp Brain Res* 2009;193(3):323–36.

WPMP1-5: Analgesia requirements post microscopic versus endoscopic transsphenoidal surgery

S. Muquit & N. L. Dorward (Department of Neurosurgery, Royal Free Hospital, London, UK)

Objectives: We compared patient analgesia requirements post microscopic and endoscopic transsphenoidal surgery.
Design: This was a retrospective study, looking at analgesia requirements (from drug prescription charts) during post-operative hospital stay.
Subjects: Data was collected on all patients undergoing transsphenoidal surgery, performed by a single neurosurgeon at one neurosurgical centre between November 1999 and March 2009.
Methods: We collected medical notes (including presciption charts and discharge notes) for all patients who had transsphenoidal surgery (either endoscopic or microscopic) and compared their analgesia requirements.
Results: Of a total of 179 patients, 93 had microscopic surgery and 86 had endoscopic procedures. Patients undergoing endoscopic surgery required weaker post-operative analgesia. In the microscopic surgery group 15 patients (16.1%) required paracetamol only compared to 44 patients (51.2%) in the endoscopic group. 70 (75.3%) patients in the microscopic group required paracetamol plus a weak opiate (codeine or tramadol) compared to 39 patients (45.3%) of the endoscopic group. 8 patients (8.6%) required morphine post microscopic surgery compared to 3 patients (3.5%) post endoscopic surgery. Statistical analysis using chi squared test showed significance with $p < 0.001$.

Conclusions: We conclude that patients experience less pain post endoscopic surgery compared to microscopic surgery.

WPMP1-6: Comparison of kinematic profiles of a patient with simultaneous bilateral pedunculopontine nucleus (PPN) & subthalamic nucleus (STN)-Deep Brain Stimulation (DBS) and another patient with unilateral PPN-DBS for the treatment of gait disturbance in advanced

M. J. Naushahi, L. A. Ah-Kye, N. Pavese, P. G. Bain & D. Nandi (Imperial College Neuromodulation Group (ICNG))

Objectives: Bilateral PPN & STN-DBS or unilateral PPN-DBS, contralateral to the most severely affected side of the body (in terms of rigidity and akinesia), may improve the axial motor symptoms of advanced PD. Here we compare the kinematic profiles of a patient with simultaneous bilateral PPN & STN-DBS and another patient with unilateral PPN-DBS for the treatment of gait disturbance in advanced PD.
Design: Clinical Trial.
Subjects: A 56-year-old, right-handed man with advanced idiopathic PD of 8-years duration and a 55-year-old, right handed man with advanced idiopathic PD of 18-years duration and previous left pallidotomy, both with a history of freezing of gait, postural instability, marked ''Off'' akinesia and ''On'' dyskinesia underwent simultaneous bilateral PPN & STN-DBS implantation.
Methods: With both patients in half ''Off''-half ''On'' medication state, kinematic profiles were analysed during bilateral PPN & STN-DBS and unilateral PPN-DBS, respectively, using a neurophysiological paradigm recently developed in our laboratory [1, 2] to analyse gaze displacement and inter-segmental co-ordination during large whole body voluntary rotations.
Results: Unilateral PPN-DBS at 2.0 V, 20 Hz, 60 microseconds achieved 35% reduction in contralateral foot latency and 45% increase in contralateral foot velocity (both $p < 0.000001$). Bilateral PPN-DBS & STN-DBS at 2.5 V, 130 Hz, 60 microseconds, resulted in significantly reduced latencies and increased velocities (excluding head velocity) in all axial motor segments (all $p < 0.05$).
Conclusions: Performance changes in the relevant axial motor segments due to PPN-DBS associated with STN-DBS may be useful in improving gait ignition failure (freezing) for the treatment of gait disturbance in advanced PD.

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1. Hollands MA, Ziavra NV, Bronstein AM. A new paradigm to investigate the roles of head and eye movements in the coordination of whole-body movements. *Exp Brain Res* 2004;154(2):261–6.
2. Anastasopoulos D, *et al.* Gaze displacement and inter-segmental coordination during large whole body voluntary rotations. *Exp Brain Res* 2009;193(3):323–36.

WPMP1-7: Regression of Chiari I malformation after medical treatment with acetazolomide

S. S. Arava, A. Toma, N. Haliasos & L. Watkins (The National Hospital for Neurology and Neurosurgery, London, UK)

Objectives: In Chiari I symptomatic patients the mainstay of treatment is the surgical intervention. There is a minority of patients who present with mild symptomatology and or do not wish to undergo surgery. We present a rare case of radiological and symptomatological regression of Chiari Malformation by the use of acetazolomide and watch&wait policy.
Design: Clinical case report.
Subjects: 36yr old male Ex professional boxer.
Methods: 36yr old male Ex professional boxer presented for routine medical check up for professional licensing in Feb 1998. A CT scan showed enlarged ventricles with no other signs. He was regularly followed up as he was symptom free, in both hydrocephalus and ophthalmology clinics. In 2002 his mild frontal headaches became more prominent. Cranial MRI in 2002 showed enlargement of 3ed and 4th ventricles with aqueduct stenosis along with a 6mm tonsillar herniation (Chiari 1 type descent) As symptoms were mild and patient did not wish to have surgery he was managed conservatively with regular analgesia. However he continues to have symptoms and underwent ICP monitoring in Dec 2005 which normal. In 2007, headaches worsened further without significant change in his MRI. Patient still did not wish to have surgery so he was offered the option of acetazolomide 250mgs b.d.
Results: Headaches improved significantly and he was able to discontinue His headaches improved significantly and he was able to discontinue the medication after 10 months. His follow up cranial MRI in 2009 showed surprisingly regression of Chiari descent. He is been symptom free since then.
Conclusions: Consideration of acetazolomide therapy in mild symptomatic patients may be an alternative option. Currently no series exist on exploring this topic.

WPMP1-8: Accuracy of EVD insertion in a neurosurgical unit

P. Z. Phyu, N. Ugboma, K. M. David & B. Arvin (Queens Hospital, Romford, UK)

Objectives: To analyse the accuracy of EVD insertion.
Design: Retrospective observational study.

Subjects: 44 EVDs in 40 patients with primary frontal EVD insertions with postoperative CT scans, from January to December 2010.
Methods: All frontal EVD insertions performed in our unit in 2010 (identified using the theatre logbooks). Postoperative CT scans were analysed. Patients with revision EVDs and no postoperative scans were excluded. Location of burr hole, EVD tip and intracranial catheter length were analysed by two authors independently.
Results: 67 frontal EVD insertions were performed in this period. 44 EVDs fulfilled the criteria. 61% of EVD tips were in the ipsilateral lateral ventricle, 14% in the third ventricle, 16% in the contralateral ventricle and 9% in the brain parenchyma. Mean EVD length for all catheters was 54 mm and for those ending in the desired location was 51 mm. Mean lengths of EVDs ending in undesired locations were 36mm (short) and 66mm (long). The mean distance from the midline was 32 mm and from the coronal suture was 27 mm (anteriorly). There was no significant statistical difference between 2 analysers.
Conclusions: There was considerable variation in the position of the frontal burr holes in this study group. The majority of the catheter tips were in CSF space. The commonest cause of undesirable location was the length of EVD. We recommend a simple location for the frontal burr hole, Kocher's position (1.0 cm in front of coronal suture and 2.5cm from midline). The catheter length should be less than 5.5 cm. The weakness of our study was a retrospective design and in some cases the catheter may have been dislocated after the insertion and before the CT scan. Further study is planned to re- audit burr hole positioning and EVD length in the future.

Spine 1

TAMP1-1: Clinical and Functional Outcome after surgery for 42 consecutive intramedullary spinal cord tumours at a single institution

R. M. deSouza, A. Borg, Z. Fox & D. Choi
(The National Hospital for Neurology and Neurosurgery, London, UK)

Objectives: Intramedullary spinal tumours can cause progressive neurological deterioration if left untreated. We identify predictors of clinical and functional outcomes following tumour resection in patients with intramedullary spinal tumours.
Design: Retrospective review.
Subjects: All patients who underwent surgery for intramedullary spinal cord tumour between January 1998 and March 2009.
Methods: We reviewed the case notes of 42 patients. The parameters collected for each case included: pre and post operative neurological status, tumour level and histology, surgeon's subspecialty and degree of resection. In addition, recurrence at follow up was also evaluated. Multivariate analysis was performed to identify predictors of recurrence and disability.
Results: A total of 42 patients were included: 39 had ependymoma tumours and three had s, 1 astrocytoma, 1 haemangioblastoma and 1 haemangiopericytoma tumours.Follow up ranged from 2 months to 13 years. From 32 patients with follow-up information, tumours recurred in 13 cases (40.6%).the odds of tumour recurrence was 1.54 (95% CI: 0.32–7.26) higher for incomplete resection versus total resection. Individuals with incomplete resection had a −2.12 (95% CI: −5.17–0.92) lower limb power score than those with total resection; 64% of patients with total resection did not have recurrence compared to 36% of patients with incomplete excision.
Conclusions: Incomplete resection was associated with a higher incidence of tumour recurrence and worse limb power after surgery compared to total resection. Data in the literature is sparse due to the rarity of these tumours but generally supports complete resection as the optimal treatment for such neoplasms We recommend that complete excision, particularly for ependymomas, should be the goal, performed in units with specialist spine experience.

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TAMP1-2: Spinal pedicle screw insertion: Percutaneous Versus Open techniques

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(Neurosurgery Department, Hull Royal Infirmary)

Objectives: Objective: The study compares the outcome of pedicle screw insertion in the thoracic and-lumbar regions using the percutaneous and open techniques.
Design: Retrospective data of 95 patients and analysed using excel.
Methods: Ninety five patients who were operated on between 2009 and 2010 were analysed. Patients age ranges from 15 to 79 (mean 52.8). Pathology includes trauma, tumour and spondylolisthesis. All the patients had pre-operative CT/MRI imaging and post-operative CT. 19 patients had percutaneous surgery while 76 had minimal invasive or open operations.
Results: Mean overall anaesthetic time for percutaneous surgery was 94 minutes vs. 163 minutes for open cases. Mean haemoglobin loss was 0.3g for percutaneous operations and 2.4g for open surgery. No complications were seen in percutaneous pedicle screw insertion and all the patients were discharged directly home. However in the open group, complications included CSF leak, recurrence of symptoms,

dura tear and sensory loss. The X-ray dose was higher in percutaneous, surgery (76 vs. 47.8 seconds). Average length of stay was 9 days in the percutaneous group and 7 days for open surgery.
Conclusions: Our study data supports the findings from earlier studies, whilst raising new areas for further investigation., such as radiation dosage and length of hospital stay.

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TAMP1-3: C1-C2 Posterior Fixation: Harms' Versus Magerl's Techniques. Which Is Better?

P. Vergara, J. S. Bal, A. T. H. Casey, H. A. Crockard & D. Choi (National Hospital for Neurology and Neurosurgery, London, UK)

Objectives: To compare the pros and cons of the most popular C1-C2 posterior fixation used today: C1 lateral mass-C2 pedicle screw (Harms) and transarticular screw (Magerl) fixations.
Design: Retrospective review.
Subjects: 122 patients who underwent Harms' or Magerl's fixation for atlanto-axial instability.
Methods: Retrospective review of 122 patients who underwent Harms' or Magerl's fixation for atlanto-axial instability. Surgical, clinical and radiological outcomes were compared in the two groups.
Results: 123 operations were performed, of which 47 by Harms' technique (Group H) and 76 by Magerl's technique (Group M). No significant differences were found in duration of surgery, blood loss, post-operative pain and length of hospitalisation. Post-operatively, neck pain, C2-radiculopathy and hand function improved in both groups, with better, but not statistically significant results for Group H. The intraoperative complication rate was 2.1% in Group H and 21% in Group M ($p < 0.05$); postoperative complication rate was 10.6% in Group H and 21% in Group M ($p > 0.05$). The major complications were vertebral artery injury (2.1% in Group H, 13.1% in Group M, $p = 0.05$) and screw fracture (2.1% in Group H, 9.2% in Group M, $p > 0.05$). Fusion rate at the end of follow-up was not-significantly higher in Group H. C1-C2 range of movements in flexion/extension at the end of follow-up was lower in Group H ($p = 0.017$).
Conclusions: Magerl's with posterior wiring and Harms' techniques are both effective options for stabilising the atlanto-axial complex. However, Harms' technique appears to be safer, with fewer complications, and a more robust long-term fixation.

TAMP1-4: Assessment of the significance of Cespace cage subsidence following anterior cervical discectomy and fusion

D. Dasic, S. Vundavalli & G. Critchley (Hurstwood Park Neurosciences Centre, Haywards Heath, UK)

Objectives: To assess the frequency of Cespace subsidence following ACDF and to evaluate the potential clinical problems related to this.
Design: Anterior cervical discectomy and cage alone fusion (ACDF) has found an important niche in the treatment of cervical radiculopathy and myelopathy. Cage position and subsequent subsidence into the vertebral body can be identified on follow up x-rays. We present our experience of Cespace (BBraun Aesculap) plasmapore titanium cage subsidence into the vertebral body and the clinical outcome in these patients.

This is a retrospective study covering 34-month period (Jan 2008 - Oct 2010).
Subjects: During this study 242 patients underwent ACDF. 27 (11%) had radiological confirmation of Cespace subsidence. In this group age varied between 32 to 83 years (median: 56 years). There were 10 males and 14 females. The second group (215) did not have radiological evidence of subsidence. There were 126 males and 89 females. The average age in this group was 54 years.
Methods: All consecutive patients who underwent ACDF with Cespace cage alone were assessed over a 34-month period (Jan 2008 – Oct 2010). Patient outcomes were assessed radiologically and clinically.

Clinical presentation (symptoms and signs) and its evolution in outpatient clinics, a telephone outcome survey, on post-operative X-rays, on post-operative MRIs and the time span between the operation and the last follow up/discharge.

All images were evaluated by a Consultant Neuroradiologist. A three-point (better, same or worse) outcome measure scale was created.
Results: During this study 242 patients underwent ACDF: 27 (11%) had radiological confirmation of Cespace subsidence and consecutive vertebral end-plate collapse. Outcomes were available for 24 patients. The median follow-up for those with subsidence was 291 days (range 44–986).

Within the group with subsidence, 20 (84%) reported an improvement in their symptoms post-operatively. No improvement was noted in two (8%) and a worse clinical outcome with further deterioration was present in two (8%). Ten patients (49%), including all those who reported no change or worsening symptoms, required at least one post-operative MRI.
Conclusions: Our study shows that whilst vertebral end-plate collapse related to Cespace ACDF may occur in 11% of patients, this does not appear to be associated with a poor clinical outcome in the majority of patients.

TAMP1-5: Pre-operative Obesity impacts post-operative return to work but not satisfaction following lumbar discectomy

P. M. Brennan, G. M. Bough & P. A. Bodkin (Department of Clinical Neurosciences, Edinburgh, UK)

Objectives: Anecdotally, patient obesity impacts on neurosurgical decision making in the management of lumbar disc disease. We sought to assess whether pre-operative obesity impacts patient satisfaction and time to return to work following operative primary lumbar discectomy.
Methods: Appropriate ethical approval was obtained for a prospective study of lumbar discectomy outcomes. Patients recruited to the study completed a questionnaire, based on validated outcome scales, preoperatively and 3 months post operatively.
Results: Of 120 patients recruited to the study (60% male, 40% female), 87% returned their post-operative questionnaire. 27% were clinically obese. 92% were working at onset of symptoms and both groups were as likely to still be working pre-operatively (90%). They also had the same average perceptions of back pain and leg pain severity. There was no significant difference in their pre-operative Roland-Morris Disability Questionnaire (RMDQ) outcome scores (11vs10% obese/non-obese). Post-operatively, 19% of obese versus 13% of non obese patients perceived the operation as unsuccessful. Similarly, there was no significant difference between the groups in their post-operative RMDQ scores (8% obese vs 6% non-obese) However, the obese patients were more likely (40%vs 14%) to not have returned to work than the non-obese.
Conclusions: Although obesity can impact on technical aspects of neurosurgery and anaesthesiae, as well as risk of peri-operative morbidity, it does not appear to influence subjective outcomes following lumbar disc surgery. The connection between these outcomes and the observed differences in return to work require further analysis.

TAMP1-6: Percudyn facet augmentation as treatment for low back pain - Technique and early results of a prospective study

J. Bodnar, R. Patel & C. Ulbricht (Imperial College Healthcare NHS Trust, London, UK)

Objectives: Percudyn is a percutaneus facet augmentation device which aims to treat chronic low back pain due to degenerative disc disease (DDD). The device limits excessive extension and pressure on the posterior disc. The device can be removed percutaneusly if there has not been any improvement and the patient has still other surgical options. Patients undergoing Percudyn implantation are part of a prospective trial, which is still ongoing.
Design: Prospective cohort study of patient with chronic low back pain who have failed conservative treatment. We present the technique and early results of this study.
Subjects: Male and female patients with chronic low back pain due to degenerative disc disease who have not responded to conservative treatment.
Methods: Outcome measures: Visual Analog Score (VAS), SF-36 and Oswestry Disability Index assessed pre-operative and 6 weeks, 6months, 1 and 2 years after surgery. We only present our 6 months follow-up and complication rates.
Results: Device related complications (Implant failure, loosening of implant): none. Operative complications (Nerve injury, inaccurate placement, CSF leak): none. Post-operative complications (infection, haematoma): none. LOS: Removal of implant because of no improvement of symptoms: 1. Total number enrolled: 11.

Six months clinical data: VAS reduction Mean 3.75; ODI reduction Mean 28.5
Conclusions: In our experience, implantation of Percudyn is safe, has very little risks and provides significant improvement of chronic low back pain in some patients. It can be removed easily if necessary and does not seem to have any significant implications for the long term future.

Although we doubt that Percudyn will be the long term cure for a large number of patients with chronic low back pain, it is an option for patients who have failed conservative treatment.

References:

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Spine 2

TAMP2-1: Comparison of pain levels and satisfaction between day surgery patients and inpatients in the first 48 hours following lumbar microsurgery

A. Philip, C. C. Wigfield & J. Albarran (Frenchay Hospital, Bristol, UK; University of West of England, Bristol, UK)

Objectives: To compare self-reported pain levels and analgesic consumption between day surgery patients and in patients in the first 48 hours after lumbar microdiscectomy.

To explore levels of satisfaction with overall postoperative pain management.
Design: Prospective descriptive survey.

Subjects: Using power calculation 36 patients were enrolled under strict criteria. 31 patients completed the questionnaires of which 16 were day surgery (mean 41years) and 15 (mean 44 years) from inpatient groups.
Methods: Pain was self assessed using VAS (0–10), incorporating analgesic consumption and other activities undertaken to relieve pain. Two open ended questions to assess patients' satisfaction to pain relief measures added a qualitative element. A non-probability purposive sampling technique was used to recruit patients. Statistical methods used were mean, range and standard deviation.
Results: The VAS scores reported was comparatively lower than previously reported1,2. The percentage of pre-operative VAS (n = 31) rated as mild, moderate and severe were 13%, 39%, and 48% respectively. In contrast there is a reversal post-operatively (42%, 45% and 13%). Day surgery patients reported lower incidence of pain (VAS 3.8; SD1.836) compared to inpatients (VAS 5.4; SD 2.044). T-test of 0.035 is statistically significant. The trajectory of pain, analgesic intake and activities undertaken were non-significant. Thematic analysis of open ended questions revealed greater satisfaction among day surgery patients.
Conclusions: Lumbar microdiscectomy patients in day surgery receive better pain management and adequate information as greater attention is focused on early and safe discharge. When carefully selected day surgery patients can effectively manage pain independently compared to inpatients. More research using large sample size is required to eliminate confounding factors.

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TAMP2-2: Acute spinal cord injuries – The neuroanaesthetic perspective

M. C. Werndle, A. Zoumprouli, T. L. Jones, B. A. Bell & M. C. Papadopoulos (St George's University of London, London, UK)

Objectives: To ascertain the current medical treatment of acute traumatic spinal cord (SCI) injuries within the British Neuroanaesthetic community.
Design: Online survey tool.
Subjects: All full members of the NeuroAnaesthetic Society of Great Britain and Ireland (NASGBI) were invited to participate.
Methods: Prior approval was obtained from the NASGBI. We asked about experience of the anaesthetist, preferences regarding anaesthesia, intraoperative monitoring during spinal surgery for traumatic SCI, and management in the intensive care unit in the week following injury. A total of 96 responded (37% response rate).
Results: Desflurane (35%), TCI propofol & remifentanil (33%) and sevoflurane (27%) were the preferred anaesthetics used. Most neuroanaesthetists (96%) avoided agents known to increase intracranial pressure. Intraoperative monitoring was variable: 15% always measure central venous pressure; 78% invasive arterial blood pressure and 6% non invasive cardiac output. We assessed whether, in the intensive care unit, neuroanaesthetists manage spinal cord injury similar to brain injury. Only 3% consider mannitol or hypertonic saline. No one advocates hypothermia. Most (92%) maintain arterial pCO2 and pO2 within normal ranges. There was uncertainty about optimal mean arterial pressure; 54% aimed for >80 mmHg, with the use of inotropes if required.
Conclusions: There is variability in the anaesthetic management of SCI. Our data suggests British Neuroanaesthetists assume that the injured spinal cord responds in the same way as injured brain. Intraoperative monitoring, however, is more limited and their intensive care management does not follow the same principles as used for brain injury.

TAMP2-3: Discitis caused by atypical organisms–a growing problem

R. M. deSouza, T. Morgado, C. Curtis, F. Robertson & J. B. Allibone (The National Hospital for Neurology and Neurosurgery, London, UK)

Objectives: To discuss diagnosis and management of discitis caused by atypical organisms.
Design: Illustrative case series and literature review.
Subjects: Case 1 – 54 year old male presenting with slowly progressive paraparesis and gastro-intestinal bleeding. The organism causing discitis and multi-system involvement was Burkholderia pseudomallei (melioidosis). Case 2 – 77 year old male with extended-spectrum beta-lactamase producing Escherichia coli discitis following a prostate biopsy. Case 3 – 61 year old lady who developed aspergillus fumigatus discitis post elective lumbar laminectomy.
Methods: Retrospective review.
Results: Historical features suggesting atypical discitis include recent urological investigations, immunosuppression and travel. Early identification of the organism causing discitis is essential and there is an increasing role for 16S ribosomal PCR in identifying organisms from culture negative specimens. Radiological presentations of discitis from

atypical organisms may mimic other conditions such as malignancy and tuberculosis.
Conclusions: Data regarding causes, clinical features and microbiological sensitivities of atypical discitis is scarce – it is important to gather this data in view of emerging resistance to help guide neurosurgical and microbiological management.

References:

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TAMP2-4: Pre-operative CT-guided placement of a flexible hook-wire marker for intra-operative localization of spinal pathology

P. M. Sammon, M. A. Hughes, R. Gibson & I. P. Fouyas (Division of Clinical Neurosciences, Edinburgh, UK)

Objectives: Intra-operative localization of thoracic spinal pathology is challenging. On-table fluoroscopy is widely used, but has clear limitations including inaccuracy of vertebral identification and radiation exposure risk to theatre staff. Several pre-operative marking strategies have been proposed, but none have shown sufficient benefit to achieve widespread use. Flexible hook-wire marker insertion was first described for localization of breast lesions, and they have also been used for localization of other soft-tissue lesions with good effect.

We propose a novel method of pre-operative CT-guided placement of flexible hook-wire markers for intra-operative identification of thoracic spinal pathology.
Design: Case-series demonstrating clinical application of a new neurosurgical procedure.
Subjects: Four patients with different pathologies (T9/10 calcified disc prolapse, T4 grade 1 meningioma, T8 Schwannoma and T7 glioblastoma) were selected for the procedure.
Methods: MRI imaging was used for diagnosis and planning of surgical approach. A flexible hook-wire was inserted following local anaesthetic. Under CT-guidance it was positioned such that it was fixed in the soft-tissue, abutting the desired boney landmark . The patient was taken directly to theatre, where dissection down the guide-wire led the surgeon directly to the appropriate point.
Results: In all four cases, the hook-wire remained in place and successfully led the operating surgeon to the pathology; in only one case was further imaging requested, though this just confirmed appropriate placement of the hook-wire.
Conclusions: Here we propose a novel method of vertebral localization that is both reliable and easy-to-perform. It requires few resources and little training, as well as eliminating radiation exposure for operating room staff. We believe this to be a significant improvement over existing techniques, and suggest that it is applicable to a wide range of spinal pathologies.

TAMP2-5: Atlantoaxial Stabilisation Using C1 Laminar Screws

B. Zebian, S. Hettige & G Critchley (Hurstwood Park Neurosciences Centre, Haywards Heath, Sussex, UK)

Objectives: Various techniques are utilised for atlantoaxial stabilisation including Magerl's transarticular screw fixation, Harms' fusion and Gallie fusion. Stabilisation using screws into the posterior arch of C1 has been described much less frequently. We aim to illustrate this technique as used in 5 patients.
Methods: We retrospectively reviewed all cervical stabilisations/fusions in our institute and identified 5 patients in whom C1 laminar screws were used. In 3 patients this was as part of C1/C2 fusion and in 2 it was part of a C1-6 fusion, 1 with C2 pedicle screws and the other with transarticular screws.
Results: All 5 patients were fused posteriorly using a construct provided by Synthes®. Postoperative analysis was with plain Xrays and 3D CT reconstruction. There were no immediate complications although one of the two patients with the longer constructs suffered a delayed complication in the form of the C1 screws fracturing out of bone.
Conclusions: We propose that atlantoaxial stabilisation using C1 laminar screws is a safe technique and we discuss its indications, limitations and outcomes.

TAMP2-6: The use of sleep studies in the management of syndromal craniofacial paediatric patients with suspected Chiari malformations

M. Al-Jumaily, J. Grogan, N. Buxton, A. Sinha, C. Duncan & P. May (Alder Hey Children's Hospital, Liverpool, UK)

Objectives: The determine the use of sleep studies in detection of central apnoea in syndromic craniofacial patients.
Design: Retrospective evaluation of syndromic craniofacial patients who underwent sleep studies to differentiate between central and peripheral apnoea.
Subjects: 10 syndromic craniofacial paediatric patients with respiratory problems.
Methods: Those patients with confirmed central apnoea on the sleep studies went on to have an MRI under GA to explore any Chiari malformation. The patients will undergo a further sleep study post-Chiari decompression.

Results: Sleep studies were sensitive in detecting central apnoea related to Chiari malformations in these patients. Thus avoiding a general anaesthetic for patients with peripheral airway obstruction.
Conclusions: Sleep studies are a useful tool in the investigation of syndromic craniofacial paeditaric patiennt to differentiate between central (related to Chiari malforamtion) and peripheral airway problems.

References:

Akita S, Anraku K, Tanaka K, Yano H, Hirano A. Sleep disturbances detected by a sleep apnea monitor in craniofacial surgical patients. *J Craniofac Surg*. 2006 Jan;17(1):44–9.

Miscellaneous

FAMP1-1: Real-time monitoring of acute neurosurgical referrals

A. J. Joannides, R. Sinha, J. J. FitzGerald, J. D. Pickard, R. J. C. Laing & P. J. A. Hutchinson (Neurosurgery Unit, Addenbrooke's Hospital, Cambridge, UK)

Objectives: Management of acute neurosurgical referrals represents a major challenge. High medico-legal risk necessitates failsafe information documentation, handover and storage within the context of an efficient workflow enabling optimal utilisation of valuable on-call time. On this background, we sought to develop, implement and evaluate a robust electronic process for referral management and monitoring.
Design: Workflow stages, outcome codes and data fields were defined and mapped systematically by an iterative process of consultation, trial and feedback. Diagnostic codes were adapted from the national neurosurgical dataset. Mapped data were incorporated within a bespoke intranet-based system (NRS), with optimised interfaces for case registration and analysis.
Subjects: All patients and clinicians involved in acute neurosurgical referrals over six months (1/11/10 - 30/4/11) were included in the analysis. Data collection and processing was performed in accordance with local Trust policy.
Methods: Recorded referrals were filtered and analysed with respect to diagnostic classification, outcome code, referral source and accepting clinician. Student's t-test was used to determine statistical significance.
Results: During the study period 2903 new referrals and 1475 repeat calls were received, with trauma representing the largest diagnostic category (32.4%). 24.7% of referrals resulted in admission, 16.4% were managed as outpatient cases, whilst the remainder did not require further involvement. Direct primary care referrals (6.1%) had a lower rate of admission compared to hospital referrals (9.4% vs 24.1%). Accepting registrars took an average of 130 ± 18 referrals and 222 ± 33 total calls, with a significant difference in the proportion of repeat calls per referral between senior and junior trainees (ST1-5: 0.82 ± 0.08; ST6-8 0.38 ± 0.05; $p^{**} = 0.0042$).
Conclusions: We demonstrate the feasibility of using a novel electronic referral process for streamlining acute neurosurgical referrals and improving patient safety, whilst also providing measurable outcomes for service evaluation and clinical training.

FAMP1-2: Dedicated daytime neurosurgical emergency theatre: A case of need

A. Khan & A. T. King (Salford Royal Foundation Trust, Manchester, UK)

Objectives: To make the case for a dedicated day time neurosurgical emergency theatre by demonstrating: a) the significant time delays encountered when neurosurgical procedures are listed on a general emergency list, b) the number of unnecessary procedures performed out of hours, c) the number of operations performed out of hours by unsupervised trainees, which could represent a day time training opportunity.
Design: Retrospective analysis of all patients listed for neurosurgery on a general emergency list at SRFT over a 1 year period beginning 1st Feb 2010 until 31st Jan 2011. Patient demographics, indications for surgery and theatre times were noted. For the month of January 2011, the time between procedure being listed and the arrival of the patient into the anaesthetic room was recorded.
Subjects: All patients listed for neurosurgical procedures on hospital generic emergency list between Feb 1st 2010 and Jan 31st 2011. Operations were categorised according to the following groups: trauma craniotomy, other craniotomy, cauda equina syndrome, other spinal, infection, ICP monitoring, external ventricular drain, ventriculoperitoneal shunt.
Methods: The times at which the operation took place were classified into 3 groups: daytime (0800–1900hrs), evening (1900–2300hrs) and night (2300–0800hrs). The presence or absence of a consultant neurosurgeon was recorded. For a single month, during Jan 2011, cases done out of daytime hours were analysed by the senior author (ATK) as to whether or not the operation was appropriate for out of hours surgery. For the same month, the delay between listing and surgery were analysed.
Results: 778 patients underwent surgery on the SRFT general emergency list during a one year period. 352 (45%) were done during daytime hours, 147 (19%) in the evening and 279 (36%) at night. During January 2011, the mean delay between listing of cases and surgery was 4.5 hours. A total of 8 cases

were delayed more than 24 hours. In the same month, 50% (14) of the night operations and 33% (4) of the evening operations could and should have been done daytime hours were a dedicated neurosurgery list available. 6% of nocturnal operations had a consultant present.
Conclusions: A dedicated daytime emergency neurosurgical theatre would reduce delays waiting for theatre, reduce inappropriate out of hours operating and improve the training opportunities in emergency neurosurgery theatres.

FAMP1-3: Oxford Craniotomy Infections Database: A cost analysis of craniotomy infection

A. B. O'Keeffe, T. Lawrence & S. Bojanic
(John Radcliffe Department of Neurosurgery)

Objectives: We describe the process of establishing a large database for the investigation of craniotomy infection and the preliminary results of this database. The initial results have been used to generate a cost analysis for craniotomy infection.
Design: The craniotomy infections database prospectively registers craniotomy cases taking place in the John Radcliffe Hospital. Patient's details are registered at the time of operation and followed up in order to identify cases of infection. Case-matched controls were used to test for a significant difference in length of stay between cases of craniotomy infection and uninfected craniotomies.
Subjects: The first 10 months of data are presented here which identifies a total of 245 craniotomies and 20 verified craniotomy infections.
Methods: Infection was defined according to Centre for Disease Control criteria and validated by at least two members of clinical staff.
Results: An overall infection rate of 8% is identified and the cost incurred by the neurosurgery department as a result of craniotomy infections is estimated at £185,660 for the 10 month period studied. This amounts to a cost per case of infection of £9,283.
Conclusions: Craniotomy infection is associated with a significantly increased length of stay as an inpatient. Increased cost of craniotomy infection amounts to £9,283 per case.

FAMP1-4: Post-Operative Monitoring of Cortisol and Thyroid Function Following Transsphenoidal Surgery

V. A. Elwell, R. Nash, J. P. Grieve & M. Powell
(The National Hospital for Neurology and Neurosurgery, London, UK)

Objectives: Following transsphenoidal surgery, neurosurgical patients may develop serious endocrine dysfunction, including hypothyroidism and Addisonian states. Recent studies have demonstrated that following pituitary surgery, hypocortisolaemia is noted in approximately 22–31% of patients. These patients required hydrocortisone replacement in the short term, and approximately 2% of patients will require lifelong treatment. Hypothyroidism may also occur in 33–35% of patients. Deficiencies in both cortisol and thyroid hormone should be monitored in the post-operative period and readily corrected to avoid potential life threatening complications.
Design: An in-depth retrospective study was conducted. Medical records, demographic, pathological, and laboratory data were collated.
Subjects: 200 consecutive neurosurgical patients undergoing transsphenoidal surgery were analysed.
Methods: 200 consecutive patients undergoing transsphenoidal surgery were identified. Clinical records, demographic, pathological, and laboratory data were collated and analysed.
Results: Patient Demographics: Age range: 15.4–84.4 years. Median age: 50 years & mean age: 49.4 years (SD 15.1). F:M ratio-1:1.04. Tumors Types: 79% of tumors were positive for immunohistochemical staining for hormonal-secretion (37% LH + FSH, 25% PRL, 23% GH, 12% GH 3% TSH). 91% of patients had a post-operative measurement of cortisol (44% day 1, 84% day 2, 45% day 3, 13% day 4, and 10% day 5) and the remaining 9% received hydrocortisone replacement. 27% of patients did not have thyroid function assessed or undergo thyroid replacement. A minority of patients with borderline hypocortisolaemia (3%) and hypothyroidism (4%) were also not commenced on replacement.
Conclusions: It is concluded that whilst we are conscientious at monitoring post-operative cortisol levels, we are less reliable in assessing for thyroid function following pituitary surgery. The specific inclusion of thyroid function testing into a pre-existing integrated care pathway is now recommended. The objective of this research is to highlight the importance of close post-operative monitoring of the hypothalamic-pituitary axis and prevention of potential endocrine complications. We have identified that the post-operative assessment is a difficult area of management in the spectrum of this complex disease. Early and long-term success of pituitary surgery is based on initiation of early clinical assessment and regular monitoring to avoid adverse effects to our patients.

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pituitary adenoma to predict the need for long- term glucocorticoid supplementation. *J Neurosurg*. 2009;111(3): 540–4.

FAMP1-5: Intra-operative use of wireless tablets devices for manipulation of imaging

M. Arora & A. Golash (Royal Preston Hospital, Fulwood, Preston, UK, PR2 9HT)

Objectives: Intra-operative use of wireless image access using Apple IOS and Android devices for viewing and manipulation of PACS images.
Design: An Apple Ipad and Android Vega tablet devices are setup in a sterile environment, with access to imaging of respective patient during the surgical procedure over a closed network. Assess ease of use and ergonomics of the image manipulation as an effective tool in the surgeon's hand.
Subjects: The two devices are used separately for intra-op use in similar spectrum of cases. Elective cases for surgery are put in both arms of device usage with similar number of images and repeated need of access. 10 cases each are used from straightforward neurosurgical procedures to complex cases by a neurosurgical firm.
Methods: Elective cases for the use of the devices are identified and recruited pre-operatively. Normal access to imaging was assured and made available as back up during the surgeries. Free Dicom viewing software available on the internet was used and accessed using wireless manipulating software with tablet devices. To view the images, they were linked to a wall mounted monitor system attached to a separate computer within the theatres and displayed and accessed by the surgeon while scrubbed during the procedure.
Results: The ease of access to the images by the surgeon and manipulation during the procedure results in decreased dependency on theatre staff for changing and showing appropriate scans. It reduces operating time as imaging manipulation is always at hand and provides a better operative flow for the surgeon and the surgery itself. Both devices have pros and cons for use and are better utilised by experience.
Conclusions: Portable and wireless image systems are upcoming and available for intra-op use. These usually come at premium costs to the trust and are setup in specific theatres. We show how mass produced devices can be utilised for this new evolution of image access intra-operatively, providing a fluid environment for the surgeon during the procedure. With further usage of the devices and further development and support of IT departments, this can easily become a pivotal point for the smooth running of theatres.

References:

ITap Wifi Touchpad for Ipad and Android devices. Osirix Dicom software for Macs and IOS devices.

FAMP1-6: Geographical distribution of abstracts presented at SBNS meetings from UK neurosurgical centres – should this guide applicants interested in academic neurosurgery?

A. Macdonald & D. Peterson (Charing Cross Hospital, London, UK)

Objectives: To quantify the participation of neurosurgical units and training deaneries in the bi-annual meetings of the Society of British Neurological Surgeons (SBNS) by counting successful abstract submissions.
Methods: Abstracts presented as either a poster or oral presentation in the past five years (2007–2011) were searched for in the British Journal of Neurosurgery. The neurosurgical centre of the first author was recorded and a total for each of the UK's 35 centres was calculated. In addition, this information was tabulated according to the 'Units of Application' to which applicants to neurosurgical training rank.
Results: 883 abstracts were presented by UK neurosurgical units over the last five years. There were large variations in the academic output of centres when judged by accepted submissions to SBNS meetings. This ranged from 1 to 76 abstracts over a five-year period. When deaneries were considered as whole there was still considerable variation. London had the highest output with 213 abstracts and Wales was the least prolific with 14. When adjusted for number of neurosurgical units in each deanery there were still notable outliers.
Conclusions: Neurosurgical centres and deaneries vary hugely in their participation at the SBNS meetings when assessed by accepted abstracts. Future trainees interested in academic neurosurgery should consider this carefully in deciding their preferred unit of application. However, the relationship between participation at the SBNS to a unit's overall quantity or quality of published research remains to be demonstrated.

FAMP1-7: The UK National Cranioplasty Survey

E. Broughton, R. Bhatia & H. Ellamushi (Royal London Hospital, London, UK)

Objectives: To determine the indications, timings, materials and outcomes of cranioplasties performed by neurosurgeons in the UK.
Design: Online survey sent to all SBNS-affiliated neurosurgeons in the UK.
Subjects: 110 neurosurgeons in all units across the UK (including N.Ireland) were emailed the survey, and 50 neurosurgeons responded.
Results: The most common indication for cranioplasty is trauma, performed by 100% of responders. Other indications include calvarial bone tumours

(66%), brain tumours (62%) and osteomyelitis (56%). The majority of patients (54%) wait 3–6 months after craniectomy before cranioplasty is performed. The most common indications identified for delay are: to minimise risk of infection (42%), allow reduction in brain swelling (30%) and overall recovery from original injury (30%).

The most common first-line material used is titanium plate (56%) followed by autologous bone (27%), titanium mesh (7%), PEEK (4.2%) and acrylic (4.2%). 98% of surgeons use antibiotics on induction but only 36% routinely use antibiotics post-operatively. Despite this, the most common post-operative complication was infection with a quoted rate varying from 2 to 30%.

Conclusions: There is an extremely varied practice for cranioplasty performed in the UK, particularly in the choice of biomaterial, timings, antibiotic usage and complication rates. This supports the creation of a steering committee in order to formulate guidelines. Future work will survey the disciplines of plastic and maxillofacial surgery in order to compare management protocols.

FAMP1-8: Antiplatelet therapy in the emergency neurosurgical setting

B. Zebian, F. Newman & C. Hardwidge (United Kingdom)

Objectives: Antiplatelet agents causing irreversible inhibition of platelet aggregation pose a significant and unwelcome challenge for neurosurgeons. In our unit 13.1% of patients referred as neurosurgical emergencies who potentially required surgery were on Aspirin and/or Clopidogrel. In an attempt to rationalise our management in these emergencies we decided to evaluate the current UK practice. Is there an evidence based strategy for dealing with this situation?

Design: We conducted a literature search of PubMed using the terms Aspirin/Clopidogrel/antiplatelet therapy/neurosurgery/bleeding to identify potential risk and therapeutic possibilities. We then contacted all the UK neurosurgical units with a reproducible telephone survey to enquire about local practice.

Subjects: All 33 adult neurosurgical units in the UK were contacted and the neurosurgical registrar on call spoken to.

Methods: Telephone survey between April and May 2011 conducted by the same co-author.

Results: 9 units (27.3%) stated they have a policy but only a verbally agreed one. 8 of those (24.2%) advised the routine use of platelet transfusion in the emergency setting; 1(3%) advised not using platelets. The remaining 24 units (72.7%) had no agreed policy.1 unit (3%) routinely used platelet function testing.

Conclusions: It is striking that there is no clear uniform practice in the UK. Our literature search has indicated that the operative risk is increased with antiplatelet treatment. While platelets are most commonly prescribed there is little evidence that it helps and there are the usual transfusion risks. Consideration of alternatives including DDAVP and Recombinant factor VII should be made.

FAMP1-9: Outcome of a cohort of elderly patients admitted to a single neurosurgical unit over six month period

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Objectives: The trend of increasing life expectancy has invariably resulted in a surge of elderly patients presenting with neurosurgical problems. Published studies have focused on the outcome of geriatric neurosurgical patients following specific neurosurgical procedures. There is however limited data on the overall outcome of elderly patients admitted to neurosurgical units, both those undergoing active neurosurgical treatment and those who are subsequently deemed unlikely to benefit from neurosurgical intervention.

Design: retrospective analysis.

Subjects: All patients over 75 earsadmitted to the neurosurgical unit.

Methods: Telephone interview using the Bartel Index.

Results: 87 patients were identified during the period. The mortality rate at 1 year for those patients who were contactable was in excess of 50%. Statistical analyses of the patients did not demonstrate outcome was affected by age group over 75 or sex in our patient cohort. The type of procedure performed did have a statistically significant effect on both mortality and quality of life at 1 year.

Conclusions: Mortality for geriatric neurosurgical patients remains high and the decision to admit and/or treat such patients may still present a management dilemma. Our results will inform surgical practise in this particular patient cohort within our catchment area. Further studies with larger patient numbers on a national basis and a longer follow-up period are required to create a robust evidence-based for the treatment of the elderly neurosurgical patient.

References

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2. Effects of age and coormobidities on complication rates and adverse outcome after lumbar laminectomy in elderly patients. *Spine* 2008 May 15;33(11):1250–5.

POSTER PRESENTATIONS

Abstract Titles

P1: A snapshot of DGH management of head injuries with an analysis of referral practices to neurosurgery
J. S. Bal[1], G. Atkin[1] & M. Murphy[2] ([1]Barnet and Chase Farm Hospitals, London, UK; [2]The Royal Free Hospital, London, UK)

P2: Occipito-cervical fixation in paediatric trauma – after fusion story
M. Trivedi, A. K. Tyagi & G. Towns (Department of Neurosurgery, Leeds General Infirmary, Leeds, UK)

P3: Midline corpectomy in decompression for multi-level cervical spondylosis - Increased surface area of decompression with preserved stability
S. Akmal & R. Gullan (Kings College Hospital, Denmark Hill, London, UK)

P4: Gamma Knife Radiosurgery For Recurrent Intracranial Eshesioneuroblastoma
E. B. Dinca, J. Yianni, M. W. Radatz, J. Rowe & A. A. Kemeny (The National Centre for Stereotactic Radiosurgery, Sheffield, UK)

P5: Does the neuro-oncology service in South East London/ Kent meet national guidelines for standard of care – a questionnaire based study
T. Jeffcote, J. Logan, E. Maratos, R. Bhangoo & K. Ashkan (Kings College Hospital, London, UK)

P6: What are the health risks of mobile phone usage? A review of the evidence and current guidelines
K. S. O'Neill (Charing Cross Hospital, London, UK)

P7: Rare mxyopapillary ependymoma with extradural extrension in two paediatric patients
I. A. Anderson, R. Kumar, M. Elliott, J. Livingston, S. Pickton, J. R. Goodden, A. K. Tyagi & P. D. Chumas (Department of Neurosurgery, The General Infirmary at Leeds, UK)

P8: Gamma Knife Stereotactic Radiosurgery: A cause of ocular neuromyotonia?
T. P. D. Blackburn, W. C. Sze, S. Murahari, H. I. Sabin, J. Wadley, J. McQuillan, A. Nadeem, W. M. Drake (The London Gamma Knife Centre, St.Bartholomew's Hospital, London)

P9: Drama therapy for patients newly diagnosed with brain tumours: A pilot study of a novel intervention

E. Maratos, J. Logan, V. Hurwitz, A. Singleton, R. Blake, S. Kokkinos, R. Bhangoo & K. Ashkan (Department of Neurosurgery, King's College Hospital, London, UK)

P10: Meningioma mimicking schwannoma
M. C. Werndle, T. L. Jones, P. Rich, L. Bridges & M. C. Papadopoulos (St George's University of London, London, UK)

P11: Subarachnoid haemorrhage in a 17-year old with Alagille's Syndrome-management challenge?
D. O'Connell[1], C. Kaliaperumal[1], N. Fanning[2], G. Wyse[2] & G. Kaar[1] ([1]Department of Neurosurgery, Cork University Hospital, Cork, Ireland; [2]Department of Neuroradiology, Cork University Hospital, Cork, Ireland)

P12: Intraparenchymal brain haemorrhage: prognosticating factors
A. F. Alalade, K. Gundur & J. Yeh (The Royal London Hospital, London, UK)

P13: Serum Magnesium Level Monitoring in the Acute Neurosurgical Patient

D. J. Davies, L. Davies, A. Hughes & P. Gan (Queen Elizabeth Hospital Neuroscience Unit, Birmingham, West Midlands, UK)

P14: Neurosurgery and the elderly patient: what's the real cost?
I. A. Anderson, E. J. Owen & D. Pal (Department of Neurosurgery, The General Infirmary at Leeds, UK)

P15: Idiopathic intracranial hypertension following surgical treatment of arachnoid cyst-Experience with three cases
C. Kaliaperumal, J. C Marks & G. Kaar (Cork University Hopsital, Wilton, Cork, Republic of Ireland)