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ABSTRACTS

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ORAL PRESENTATIONS

1 Top 8 – Oral Presentation

0164

Molecular profiling of osteogenic disregulation in non syndromic craniosynostosis: new insights from microarray and morphological studies

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Introduction: The genetic basis and the molecular pathogenesis of non syndromic craniosynostosis (NS-CRS) are still largely unknown. This study attempted to clarify the molecular mechanisms underlying the premature ossification of calvarial sutures, using microarray analysis to perform exon-level genome-wide expression on calvarial suture specimens of NS-CRS patients.
Methods: Calvarial specimens from both fused and unfused sutures were collected during surgery from patients affected by NS-CRS patients. Matched samples of each patient was used for comparative microarray gene expression analysis. The list of statistically significant differentially expressed genes underwent algorithm-based biological interpretation and functional validation in calvarial-derived cells using confocal microscopy.
Results: Gene-level analysis allowed identifying 28 significantly modulated genes, mainly involved in cell adhesion, cell-matrix interaction, matrix mineralization, osteogenesis, and tissue development. Over 120 genes showed exon-level differential expression, indicating the differential somatic expression of different gene isoforms at the dysmorphic site. Interestingly, this list included: the CRS-associated genes FGFR1-3 and TWIST1, the hydroxyprostaglandin dehydrogenase, and several genes involved in the structure and functions of the primary cilium and of mitotic spindle assemblage, which were confirmed by immunofluorescence on cells.
Conclusions: These data allowed identifying two novel interacting molecular mechanisms possibly involved in NS-CRS pathogenesis, namely the prostaglandin E2-related signaling and the primary cilium-mediated transduction.

0116

Umbilical cord blood and erythropoietin combination therapy trial for children with cerebral palsy

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The aim of this randomised placebo controlled trial was evaluated the efficacy of umbilical cord blood(UCB) and recombinent human erythrooietin(rhEPO) combination therapy for children with cerebral palsy(CP). Children with CP, aged between 10 months and 10 years, were recruited, who had received rehabilitation therapy for 6 months previously. The participants were randomized into three pararell groups; 1)UCB group receiving allogenic intravenous UCB and rhEPO, 2)EPO group receiving rhEPO and placebo UCB and 3) control group receiving placebo UCB and placebo rhEPO. Gross motor performance measure(GMPM) and gross motor function scores were checked at post-treatment 6 months. 18 F-FDG PET/CT and DTI image of MRI were performed as the baseline and followed at post treatment 2 week(PET) and 6 months(DTI). In UCB group(n=31) there were significant increase in GMPM score at 3 and 6 months. In addition to motor function, improvement of mental function also was observed. Changes in DTI images corelated signifcantly with increased GMPM scores and changed fractional anisotrophy in UCB group. SPM analysis of FDG-PET showed different activation and deactivation areas among three groups, which suggested of different metabolic changes. There were no adverse effects in all three groups. The UCB and rhEPO combination therapy ameliorated dysfufnction in children with CP and showed structural and metabolic changes in brain.

0054

Identification of brain tumor initiating cells using the stem cell marker aldehyde dehydrogenase 1

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Aldehyde dehydrogenase 1 (ALDH1) has been identified in stem cells from both normal and cancerous tissue. This study aimed to evaluate the potential of ALDH1 as a universal brain tumor initiating cell (BTIC) marker applicable to primary brain tumors and their biological role in maintaining stem cell status.

Cells from various primary brain tumors (24 pediatric and 6 adult brain tumors) were stained with Aldefluor and sorted by flow cytometry. We investigated the impact of ALDH1 expression on BTIC characteristics *in vitro* and on tumorigenic potential *in vivo*.

Primary cultured brain tumor cells showed universal expression of ALDH1, with 0.3 to 28.9 % of the cells in various tumors identified as $ALDH1^+$. $ALDH1^+$ cells generate neurospheres with high proliferative potential, express neural stem cell markers (nestin and musashi) and differentiate into multiple nervous system lineages. $ALDH1^+$ cells are phenotypically distinct from $CD133^+$ cells, and they show high expression of induced pluripotent stem cell-related genes. Notably, targeted knockdown of ALDH1 by shRNA interference in BTICs potently disturbed their self-renewing ability. After three months, $ALDH1^+$ cells gave rise to tumors in 93 % of mice whereas $ALDH1^-$ cells did not. The characteristic pathology of mice brain tumors from $ALDH1^+$ cells was similar to that of human brain tumors, and these cells are highly proliferative *in vivo*.

Our data suggest that primary brain tumors contain distinct subpopulations of cells that have high expression levels of ALDH1 and BTIC characteristics. ALDH1 might be a potential therapeutic target applicable to primary brain tumors.

0078

Neuroendoscopic photodynamic diagnosis and biopsy of intraventricular germinomas using 5-aminolevulinic acidNeuroendoscopic photodynamic diagnosis and biopsy of intraventricular germinomas using a 5-aminolevulinic acid

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Background: Photodynamic detection with 5-amonolevulnic acid(5-ALA) during surgery has been employed recently for brain tumours as in other malignancies. The usefulness of neuroendscopic fluorescence guided detection and sampling for the intraventricular CNS germinoma has not yet been studied and confirmed.

Objects: We describe the procedure and discuss the usefulness of this method for detecting and biopsy of intraventricular lesions in CNS germinoma.

Patients and methods: Patients suspected with germinoma underwent photodynamic endoscopical detection of the intraventricular lesions. Three hours before the induction of general anesthesia, 20 mg/kg of 5-ALA was administered orally. During endoscopical surgery the wave peak of porphyrin fluorescence was observed with spectrometer by long-pass fiber through working channel after excitation with violet-blue light. Navigation system was employed for ventricular puncture in the absence of ventriculomegaly. For multiple lesions,sampling was tried for all lesions.

Results: 11 cases with neuroradiologically suspected intracranial germinoma ranging in age from 14 years to 34 years underwent this procedure. The lesions were detected in pineal region, supracellar region, septum pellucidum and/or other regions on ventricular wall. All the tissues samples taken were confirmed as germinoma histopathologically. Fluorescence peak was observed in 10 of 11 patients(91 %). The peak was not observed in a case whose lesions showed spontaneous regression after CT and cerebral angiography before biopsy. Procedure related morbidity was diplopia observed in two cases with a small lesion in pineal lesion, possibly caused by injury to tegmentum.

Conclusions: Photodynamic neuroendoscopic detection with 5-ALA can be useful method to identify the intraventricular lesions of CNS germinoma.

0302

Continuous local cerebral blood flow monitoring in children with TBI

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Introduction: To date, continuous long term monitoring of cerebral blood flow (CBF) has not been possible. Recently, a device for local monitoring of tissue CBF has become available. We present the first data for this device in children.

Methods: We examined patients who underwent monitoring of local CBF using the Hemedex system (Bowman perfusion monitor), with concurrent monitoring of intracranial pressure (ICP) and brain tissue oxygenation ($PtiO_2$).

Results: Twenty-two patients underwent monitoring for 5.2±2.1 days. There were no technical problems or complications. CO_2 challenge tests demonstrated the expected ICP responses; however, CBF and $PtiO_2$ changes were influenced by the CO_2 change *and* the associated ICP change: we observed *decreased* CBF and PtiO2 in several cases where CO_2 was increased, and paradoxical increased PtiO2 and CBF responses to hyperventilation, depending on the ICP response. CBF and $PtiO_2$ changes correlated with each other ($r=0.68$-0.83, $p<0.05$). Temporary hyperoxia tests revealed a slight decrease in CBF on average (7.7 %). Autoregulation tests demonstrated increased tissue perfusion (CBF and $PtiO_2$), even when autoregulation was intact. The Hemedex monitor responded sensitively to interventions; however, measured CBF values varied across calibrations despite stable conditions (mean difference of 21 % across calibrations).

Discussion: The Hemedex monitor responds sensitively and rapidly to physiological changes; however, the capacity for determining absolute CBF appears limited. The CBF and $PtiO_2$ responses challenge the practice of standardized treatment for all patients. These data support the concept of individualizing treatment in pediatric neurocritical care and explain some of the variability in success of past interventions.

0029

Mild Hypothermia Enhanced the Potent Therapeutic Effect of Neural Precursor Cell Transplantation in a Neonatal Mouse Model of Cerebral Hypoxia-ischemia

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We intended to determine whether whole body hypothermia after neonatal cerebral hypoxia-ischemia (HI) could enhance the potent therapeutic effect of Neural Precursor Cell (NSCs) transplantation. Postnatal day 7 mice were subjected to right common carotid artery ligation, followed by 8 % oxygen inhalation for 1.5 h. After HI,these mice were assigned randomly to three groups: NSCs repair group; NSCs repair group subjected to whole body hypothermia (28 °C for 24 h) and control group. Animals were sacrificed at 24, 48, 72 h and

1,2,4 week after the HI. The level of inflammatory factors and apoptotic factors were detected; brain sections were processed for measurement of brain infarct and immunofluorescence; neurological assessments were performed to examine the effects of these treatments. We found caspase-dependent apoptosis and inflammation were significantly higher in the NSCs repair group and control group. Meanwhile, transplanted cells survived better in the hypothermia group, and Cell-transplanted animals exhibited enhanced functional recovery on sensorimotor and behavioral tests. These suggest mild hypothermia could provide neuroprotection the graft cells associated with decreases in apoptosis and with attenuation of NF-κB activation in the ipsilateral hemisphere following HI. And mild hypothermia group could performed better in the long-term behavioral test.

0238

Introducing national minimum standards for pediatric neurosurgery in England: will they reduce complications and improve outcomes for children?

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In 2009 a project was started by Specialist Commisioners in the English National Health Service to draw up a set of minimum safe standards for paediatric neurosurgical care, with the aim of ensuring that all pediatric neurosurgical units in England would remain 'Safe & Sustainable' into the future.

After some fierce debate and iterations the latest version of the standards has now mostly been agreed by stakeholders and are out for final consultation, then implementation within the next 12 months. The standards will be described in more detail during the presentation, but they include a number of challenging specific process measures, outcome targets and maximum acceptable rates of surgical complications (eg 30 day mortality from elective cranial surgery, CSF shunt infection rate). Consequently they are popular with parents, patient support groups and commisioners, but have caused understandable anxiety amongst some neurosurgeons!

The introduction of this set of standards in England in the near future and the subsequent obligatory comparison of results between units or networks of units using compulsory collection of data into a national database of procedures / complications, could potentially produce a sustained overall reduction in rates of complications and an improvement in outcomes for children with neurosurgical conditions in England.

0213

20 years of hydrocephalus treatment in childhood: flow regulation, third ventriculostomy and others

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Objective: Evaluate the impact of a flow regulated valve (OSV shunt) and third ventriculostomy in the management of chidhood hydrocephalus over 20 years.

Methods: 1482 "new" patients (age, birth to 16 yr) undergoing their first treatment for hydrocephalus between 1987 and 2007 were included . 430 patients exhibited characteristics that indicated suitability for third ventriculostomy as first procedure, 1052 were treated with a shunt (OSV shunt in 967, pressure regulated shunt in 85). Shunt selection was based on CSF content at the time of shunt insertion.

Results: For the group treated with third ventriculostomy the probability of success was 68 % at 20 years. Most of the failures were observed in the first year after surgery. In the group treated with OSV shunt the actuarial probability of shunt survival was 50 % at 14 years follow up . Kaplan-Meier curves showed two different times of shunt malfunction: "early shunt malfunctions" where the major cause of the malfunction is surgical technique and inadequate overall management and "late shunt malfunction" where the two main causes of shunt failure are related to chronic overdrainage and aging of the device . The improvement of shunt survival in this series were mainly related to limitation of chronic overdrainage. Little had been achieved in our place concerning the prevention of "early shunt malfunction".

Conclusion: One fourth of hydrocephalus in children can be treated successfully by ventriculostomy. Limitation of chronic overdrainage reduce occurrence of shunt malfunction. Need to decrease "early shunt malfunction" by improving our management protocol.

2. *Endoscopy – Oral Presentation*

0272

Classification of ETV Failure According to Closure Pattern in Children

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The data of 25 pediatric triventricular hydrocephalus cases which, have undergone repeat endoscopic surgery due to failure of initial ETV procedure in two centers were retrospectively analyzed. Of the 25 cases 9 were under 2-years of age. Before the repeat ETV procedure, all cases have been examined with cine phase-contrast magnetic resonance imaging. Patient records on clinical features and the video recordings of the endoscopic procedures were reviewed. The re-ETV cases due to incompletely penetrated membranes during the initial procedure were excluded.

The median interval to ETV failure was 2.3 months. Repeat-ETV failed in 8 of the 25 cases (32 %). A classification was based on the three major closure patterns that were observed in the repeat endoscopic procedures: Type-1: Reclosure of the ventriculostoma with gliosis and formation of an opaque floor (8 cases and of those re-ETV failed in 5); Type-2: Narrowing or closure of the ventriculostoma by a translucent arachnoid membrane (7 cases and of those re-ETV failed in 1), Type-3: Patent ventriculostoma with new arachnoid membranes in the basal cisterns below the third ventricle floor (10 cases and of those re-ETV failed in 2). Of the 9 cases which were under 2 years, 7 presented Type-3 closure pattern.

Our data reflect a higher tendency of young children (under 2-years of age) to have Type-3 closure that lead to delayed failure of the ETV procedure. Also the success of re-ETV seems to be lower in cases, in Type-1 closure.

0249

Endoscopic third ventriculostomy in the treatment of childhood non-communicating hydrocephalus: experience in VietDuc Teaching Hospital

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Objective: The goal of this study was analyzed the result and complications of ETV which were performed in sing center of neurosurgery in VietNam.
Methods: Among 225 ETV were done in VietDuc Teaching Hospital from 2005 to 2010, 55 pediatric patients were selected. This series consists of a prospective study of the clinical and radiological features (cerebral CTscan and cerebral MRI) and outcome of 55 patients who underwent ETV. ETV was considered to be successful when there was no event occurring during surgery that resulted in the procedure being aborted, postoperative neurological deficit. The patients follow-up was for a minimum 6 months.
Results: This study population included 30 boys and 25 girls. Age ranged from 1 month to 15 years olds (mean 55 months). The cause of hydrocephalus was aqueductal stenosis in 21, tumors of the posterior fossa in 25, malformation in 4 and unknow in 5 cases. The ETV procedures were technically successful in 54. One patient complicated by intraventricular bleeding and treated by VP shunt. There were 2 other complications: one has superficial infection and one has leakage of cerebrospinal fluid. There was no mortality or major morbidity following ETV. The repeat ETV have done in 3 and was successful in 2. Four patients required VP shunt after ETV (complication, failure ETV) . Totally, the ETV was successful in 51 patients (92.72 %) and the complication was in 3 (5,45 %).
Conclusion: ETV is safe and effective in the treatment of childhood non-communicating hydrocephalus and have minor morbidity.

0141

Treatment of infantile hydrocephalus with Endoscopic Third Ventriclostomy

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Introduction: To understand the role of Endoscopic Third Ventriclostomy (ETV) for the treatment of hydrocephalus in infants, a retrospective analysis was conducted.
Methods: A chart review was conducted. 25 patients under 2 years old underwent ETV from 2000 to 2011.
Results: The mean age of the initial surgery was 11.2 months, the mean follow up term was 66 months. 19 cases were non-communicating hydrocephalus (10 aqueductal stenosis, 4 suprasellar arachnoid cysts, 2 tumor related, 1 interhemispheric cyst, 1 Dandy-walker syndrome 1 hydrocephalus related with Chiari type 1 malformation). 6 cases were communicating hydrocephalus (2 post intraventrical hemorrhage, 2 multiple anomaly related hydrocephalus, 1 persistent Blake's pouch cyst, 1 myelomeningocele related hydrocephalus).22 cases underwent ETV as an initial procedure, the other 3 had VP shunt. 6 cases had trouble during observation. 3 needed a shunt and the other 3 had received a second ETV. In the other group, all cases had switched to ETV except one. 22 cases were able to control hydrocephalus without shunting. The ETVSS score (Kurkrani et al.) of the shunt free group was 50-80p. The other group was 40-50p. Additionally, the development of the ETV success group was near to normal.
Conclusions: The ETV success rate of this series was relatively higher than other reports. The high ETVSS score supports that the selection of the cases was acceptable. ETV might be a useful modality for hydrocephalus even if the patient was under 2 years old if we carefully choose the patients.

0166

Endoscopic third ventriculostomy in patients with shunt complications and slit ventricle syndrome

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Introduction: Shunt surgery is still associated with a high rate of complications. Endoscopic third ventriculostomy (ETV) is a well established option for patients with occlusive hydrocephalus with a success rate of about 80 %. Presently, slit like ventricles are thought to be contraindications for ETV. We describe the technique to perform ETV in patients with slit ventricle syndrom as a common complication of shunt surgery.
Methods: We performed ETV in 9 patients with occlusive hydrocephalus and slit ventricle syndrom. All patients had previously implanted shunt systems or open ventricular drainage at time of surgery. Indication was in 6 patients infection, in 2 patients malfunction of the shunt, and in 1 patient persisting abdominal pain from the abdominal catheter. A pediatric ventriculoscope system (Richard Wolf, Knittlingen, Germany) combined with neuronavigation (VectorVison II: BrainLab, Feldkirchen, Germany) was used in all cases.
Results: ETV could be achieved in all 9 Patienten technically successful. There were no surgical complications. In 5 patients the endoscope was introduced into the lateral ventricle along the existing catheter, in 4 patients a new access had to be performed with the help of neuronavigation. ETV was successful in 8 out of 9 patients, one patient needed a new shunt after recovery from the preexisting infection.
Conclusion: ETV is also in patients with slit ventricle syndrom technically possible and successful. Neuronavigation is mandatory to safely puncture the ventricular system in patients with small ventricles. In case of a preexisting catheter a the right spot, the catheter can serve as a guide.

0036

Avoidance and Management of Complications in Intraventricular Endoscopy

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Introduction: Intraventricular Endoscopy has proven utility in the diagnosis and treatment of a variety of pediatric neurosurgical disorders. However, complications may occur. Complications including hemorrhage, cerebrospinal fluid leak, endocrine and neurological impairment, and diagnostic or treatment failure. Endoscopic complications may differ from those seen in craniotomy, their avoidance and management are presented with case examples.
Methods: Endoscopic cases performed or managed by the senior author were retrospectively reviewed for major complications and teaching points. The senior author performed approximately 50 endoscopic cases per year over the past 10 years.
Results: Pathologies treated include hydrocephalus, colloid and arachnoid cysts, CNS infections and tumors. Potential complications included suboptimal indications, poor patient selection, trajectory, nondiagnositic biopsy, treatment failure and focal brain edema.
Conclusion: Intraventricular endoscopy allows for the diagnosis and treatment of a variety of neurosurgical disorders through limited access approaches. The indications for endoscopic treatment continue to be evaluated and expanded. By reviewing our

experience, we hope to assist others to avoid or promptly recognize potential complications.

0110

Secession from a shunt dependency in patients with childhood hydrocephalus

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Secession from a shunt dependency is ultimate goal to avoid shunt malfunction. However, criteria to select candidate for shunt removal is not established. Therefore, our experience to remove shunts in patients with childhood hydrocephalus who were shunted previously is reported. Shunt removal was performed in 17 patients between 2009 and 2012. In 8 of 17 patients, a shunt weaning protocol was attempted before shunt removal. After externalization of the distal end of existing shunt catheter, opening pressure were gradually elevated up until patients become symptomatic or amount of drained fluid become zero (Group A) . In 9 of 17 patients underwent endoscopic third ventriculostomy (ETV) because of shunt malfunction (Group B). All patients underwent MR imaging to assess the ventricular size and bowing of the third ventricular floor before shunt removal. For follow up, MRI study, examination of the fundus, and intelligent or developmental assessment tests were repeatedly performed. ETV was performed in 4 patients in group A, because these patients became symptomatic during the shunt weaning test. These patients were associated with bowing of the third ventricular floor. ETV was successful in 3 patients. Shunt removal without ETV was performed in 4 patients in group A. ETV was successful in 8 in group B. Our study support that ETV is an effective treatment for shunt malfunction. However, our result suggests the case which does not require ETV may exist. Before shunt removal, the necessity for ETV may be judged by the shunt weaning tests.

0195

Dandy-Walker malformation and endoscopic treatment: our experience and our considerations

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The surgical treatment of the Dandy-Walker malformation continue to rises controversies in the literature and the efficiency of different surgical treatment is still a matter of debate. One of these treatment strategy lies on the endoscopy. We report our experience with 10 cases of Dandy-Walker malformation operated on with this technique.
Material and methods: 10 children, six boys and 4 girls, with Dandy-Walker malformation were treated between 2000 and 2008. All patients presented with evolutive macrocrania and two with signs of intracranial hypertension. Two patients presented global hypotonia. All cases benefited of preoperative MRI and aqueductal stenosis was diagnosed in 5. All cases were treated with first intention endoscopic third ventriculocistenostomy (ETV) associated with the opening of the floor of the cyst of the 4th ventricle in 7 patients. Four children needed a ventriculo-peritoneal shunt but no cysto-ventricular shunt was necessary in any case. Direct opening of the cyst was not done in any patient.
Complications: One patient presented an intraventricular bleeding of venous origin needing a temporary external drain for 1 week.
Conclusion: The endoscopic surgery is one of the major techniques from the treatment of the Dandy-Walker malformation but it does not replace completely the shunt techniques. In the cases were the ETV does not avoid shunting, the aqueductoplasty allow to use with success a simple ventriculo-peritoneal shunt.

0097

Neuroendoscopy in 144 pediatric patients. Follow up for 8 years. Cuban experience

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Introduction: Neuroendoscopy is a surgical technique useful for the treatment of several pathologies inside the Central Nervous System. The personal series of the first 144 cases of neuroendoscopy performed at the Pediatric Neurosurgery Service of the Juan Manuel Marquez Pediatric University Hospital in La Havana, Cuba is presented.
Method: We treated 144 children which undergo endoscopic operations for different types of hydrocephalus, arachnoid cystic and intraventricular brain tumors and their ages ranged from newborn up to15 years. The surgical technique was using a precoronal burr hole or the lateral angle of the fontanel in relation with the age. All patients were operated on by the author using a rigid Gaab scope with 6.2 mm OD coupled to a Storz light source. Prophylaxis with ceftriaxone was indicated in all cases. The clinical records, surgical protocols, radiologic studies, operative videos and follow up are reviewed.
Results: A mortality of 3 % and a morbidity of 8 % were found in this study. Mild hemorrhage, meningitis and CSF leakage were the main complications. Success was achieved in 64 % of cases in the whole series. If we only consider the group of III ventriculostomies performed in no communicating hydrocephalus, our success rate rises to 72 %.Follow-up ranges from 8 years in the first case to 3 years in the last case considered.
Conclusion: Specific results from our study are presented and allow the conclusion that this is an excellent procedure when it is well indicated. Neuroendoscopy has become an alternative to shunts in all neurosurgical units.

3. *Dysraphism – Oral Presentation*

0051

Awareness of Spina Bifida and Periconceptional use of Folic Acid among Pregnant Women in a Developing Economy

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Background: Folate deficiency in pregnant women is a recognized cause of spina bifida. We sought to establish the level of awareness of spina bifida as well as the use of folate supplementation among pregnant women in a developing economy.
Method: Interviewer-administered questionnaires were used to obtain information from two hundred and twenty randomly-selected pregnant women attending antenatal clinics at the authors' institution. Demographic information and information on parity, folic acid use, knowledge of spina bifida including its cause, prevention and treatment were obtained. Simple descriptive data analysis was done.

Results: The mean age of the women was 30.3 years (range: 17-52 years). Most {198(90 %)} have had at least 2 previous births with 13(5.9 %) being grand-multiparous. Majority {209(95 %)} of the women have at least secondary level of education.
The average gestational age at antenatal clinic booking was 20.7 weeks (range: 4 - 38 weeks) while the average gestational age at commencement of folic acid use was 18.5 weeks (range: 4 - 38 weeks). None of them used folic acid in the preconception period.
Knowledge about spina bifida is poor and a significant number {103 (46.8 %)} have superstitious belief about its aetiology. Only 56 (25.5 %) of the respondents are aware that folic acid use prevents its occurrence however, 194(88.2 %) are willing to receive periconceptional folate supplementation.
Conclusion: There is paucity of knowledge about spina bifida among Nigerian pregnant women despite their high level of formal education. We advocate an aggressive public health campaign to enlighten the women about spina bifida and encourage periconceptional folate supplementation.

0085

Histopathology of the filum terminale in children with and without a tethered cord syndrome with attention to the elastic tissue within the filum

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Introduction: The pathogenesis of cord tethering by the filum when the conus is normally located is unclear. We hypothesised that fila from children operated on for tethered cord syndrome (TCS), whether or not the conus was low, would have abnormal elastic tissue compared with normal fila.
Methods: We compared histopathology of fila removed from patients with TCS (n=26) with fila from autopsies of children without TCS (n=27). Sections of fila were stained with H&E, Masson trichrome and Verhoeff von Gieson elastic.
Results: Fila from autopsies were all <2 mm thick. Ependymal lined central canal was present in the proximal filum. More distally the canal transitioned to ependymal rosettes, and then to ependymal cells on the periphery of the filum. Fila comprised loose fibrovascular connective tissue. Elastic fibers were thin, evenly dispersed and more abundant distal to the end of the central canal. A small amount of fat was identified in 2 fila.
Fila from patients with TCS all had dense collagenous connective tissue either focally or diffusely. The elastic fibers were thick, irregularly dispersed and spiraled. Fat was identified in 22 of the 26 cases. The findings were similar, whether or not the conus was in normal or low position.
Conclusion: The abnormal connective tissue and elastic fibers in fila of patients with TCS, even when the conus was not low, suggests that these fila are less elastic than normal. This supports the concept of TCS with a conus in normal position (occult TCS).

0095

New classification of lumbosacral dimples and the incidence of underlying spinal cord malformations

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Introduction: We assessed whether specific types of lumbosacral dimples are associated with underlying spinal cord malformations.
Methods: From 2008 to 2011, we prospectively examined infants with a lumbosacral dimple. Each infant underwent clinical assessments and magnetic resonance imaging (MRI) at 4-8 months old.
Results: We evaluated 162 patients with a lumbosacral dimple. We then defined new classifications of dimples. Dimples were classified into 3 types according to the location: Type 1 dimples, located within the gluteal crease; Type 2 dimples, located at the upper edge of the gluteal crease, associated with curving or deformity of the gluteal crease; and Type 3 dimples, located far above the gluteal crease. Among the 82 infants with Type 1 dimples, 62 underwent MRI. Ten cases (16.1 %) of spinal deformity (SD) were revealed, including 8 cases of filar lipomas (FL) and 2 cases of ventriculus terminalis (VT). Among the 52 infants with type 2 dimples, 47 underwent MRI, and 23 cases of SD (48.9 %) were observed, comprising 16 cases of FL, 4 cases of TV, and 3 cases thickened filum terminale (TF). All 28 infants with type 3 dimples underwent MRI, revealing 15 cases of SD (53.6 %), including 3 cases of caudal or dorsal lipoma, 9 cases of FL, 2 cases of TF and 1 case of syringomyelia.
Conclusion: Although type 2 dimples have been classified as simple midline dimples that need no further investigations, we revealed a high association with spinal deformities comparable to that with atypical type 3 dimples, warranting radiological investigations.

0234

Sacrococcygeal dimples with spinal lesions

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Objective: Sacrococcygeal dimples are observed in 2-4 % of newborn. It has been generally thought that sacrococcygeal dimples are not associated with significant risk of intraspinal anomalies, and therefore do not require further radiographic evaluation. Accordingly, the precise incidence and nature of dimples have been unclear. To address this issue, we performed MRI for all cases with intergluteal dimples.
Materials: Subjects were 102 cases who were seen in the Niigata University Medical and Dental Hospital between 2006 and 2011 because of abnormalities in the sacrococcygeal region. Of these, we excluded 13 cases with subcutaneous fatty mass and 5 cases with dimples above the gluteus fold. The remaining 84 cases were the focus of this study.
Methods: Their dimples were classified into two types according to whether the bottom of the dimples was visible (shallow type) or invisible (deep type). We also retrospectively examined the subjects' neurological findings, surgical history, and clinical course.
Results: MRI was performed at a mean age of 5.6 months. Filar lipomas were identified in 15 cases. Among these, 6 were of shallow type and 9 were of deep type. These distributions were significantly different from those of 69 cases without filar lipomas, in which 53 were of shallow type and 16 were of deep type. Of the 15 filar lipoma cases, 7 had the lower conus and untethering operation was performed.
Conclusions: Filar lipomas were identified in 15 (18 %) patients with dimples. It is difficult to estimate the risk of filar lipomas with the depth of dimples.

0284

Chiari malformations associated with surgically induced open neural tube defect in chick embryos : A review of pathophysiology

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The fact that the frequent association of Chiari II malformation (CM II) with open neural tube defect (ONTD) has led to postulate a causal interrelation between these conditions. This study observed the morphological changes of the posterior cranial components in the chick embryo with surgically induced spinal ONTD by MRI and light microscopic inspection. To make ONTD, the neural tube was opened longitudinally for a length of 6 somites at the thoracic level in Hamburger and Hamilton stage 18-19 chick embryos. They were re-incubated in ovo up to total age 17 - 21 days (n=3 at each day). In the surgical groups which had ONTDs, the size of the posterior cranial fossa and the cerebellum were smaller than those of the control group. The subarachnoid space was markedly narrower and the fourth ventricle was also smaller. We postulate that the cerebellum grows rapidly in late gestation, independently without being influenced by cerebrospinal fluid pressure. And the developing cerebellum will be displaced to an anomalous position from the smaller posterior cranial fossa at the late stage of chick embryos.Though not always typical, the direction of deformation in this study seemed identical to that seen in the posterior fossa anomalies in humans. It suggests a strong direct causal relationship between the two conditions and supports the theories which involve cerebrospinal fluid dynamics rather than those of primary mesenchymal or neural origin. We will review the pathoembryology and pathophysiology involved in the development of the CM II associated with the ONTD.

0069

Retethering in Children after Sectioning of the Filum Terminale

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Introduction: Sectioning of the filum terminale is performed when spinal cord tethering is suspected, either with or without clinical symptoms. Retethering can occur and require reoperation because of either recurrent or new symptoms. The purpose of this institutional review was to identify the retethering rate, especially in children that were initially asymptomatic, and to discuss if surgery should be performed because of radiological findings in children with no symptoms.
Methods: The medical records of all children who underwent tethered cord surgery between 1978 and 2009 for a thickened filum terminale were retrospectively reviewed, as well as those who retethered.
Results: 146 patients with a mean age=4.3 years underwent laminectomy for sectioning of the filum terminale. 44 patients (30.1 %) were asymptomatic at the time of surgery, 51.4 % had bladder and bowel dysfunction, 26.7 % had neuro-orthopedic findings, 15.8 % had pain and 6.2 % had progressive scoliosis. 11 children with a median age of 8.9 years had symptoms of retethering requiring re-operation (median time to retether was 4.3 years) and 4 were initially asymptomatic. Repeat surgery was successful at alleviating the new symptoms that occurred as a result of retethering.
Conclusions: 7.5 % of the children retethered, with 9 % being initially asymptomatic. Those operated in the first year of life were not found to be at a higher risk. The level of the conus medullaris did not influence the rate or retethering nor urological dysfunction. Children who were initially asymptomatic improved after surgery for retethering, but may not have required surgery in the first place.

0074

Analysis of MRI tagging cine-images in children with spinal lipoma (thickened filum)

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Introduction: In this study, the momentum (synchronized in heart beat) of the spinal conus was analyzed using tagging CINE image (kinetic image) in children with filar lipoma for purpose of evaluating the tractional force for the spinal cord.
Patients and methods: Using kinetic analysis software, changes for momentum to back-forth and ups-downs directions were analyzed. We assumed peak magnitude a momentum and inspected the significant difference pre and post operation in SPSS16.0 J. As for the device which we used, MAGNETOM Symphony 1.5 T, sequence is FLASH, TR:45 ms, TE:7.9 ms, FOV:80 mm or 100 mm,Flip Angle: 15degrees, Matrix: 256×154, Slice thickness:5 mm, Scan time:abput 3 minutes. Patients were divided into 4 groups: 0~2 yo n=10, 2~4 yo n=10, 4~7 yo n=10, 7 or more n=10. In addition, we performed the comparison with an example targeted for a group of the same age groups.
Results: As for the movement of the spinal cord of the case more spinal lipoma group than a target group, the difference was not recognized with under 4 years old. However, and the momentum of ups-downs and back-forth directions significantly decreased, and improvement was confirmed post operative study in 4 years old or more age groups.
Discussion: From these results, we may judge a change of the traction force to a spinal cord from the change of the momentum with kinetic image of spinal conus estimated by MRI. When the momentum decrease was recognized before presenting symptoms fo tethered cord syndrome, kinetic images could be useful as a diagnostic tool of upcoming disease.

0158

Can pseudomeningocele be an early diagnostic indicator of tethered cord syndrome in patients operated on for myelomeningocele?

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Background: It is well known that after myelomeningocele(MMC) repair, low-lying conus medullaris and adhesions of the spinal cord on the dorsal dural sac is common findings on MRI.Therefore, tethered cord syndrome (TCS) after MMC surgery must be diagnosed clinically. However, early diagnosis of neurological deterioration and/or motor developmental delay in MMC patients is difficult because of an already apparently neurological deficit. So the authors examined whether or not pseudomeningocele at the repaired site may be an early diagnostic indicator of TCS.
Material and Methods: Between 1994 and 2011, 50 patients (25 females, 25 males) received untethering for TCS after MMC repair. Age at operation was between 8 months and 30 years (average: 8.5 years). Neurological deficits for surgical indication was as follows: motor impairment 38, pain of back and/or lower limbs 17, neurogenic bladder 9,

worsening of scoliosis 5. Follow-up periods were from 5 months to 17 years. To find the early diagnostic indicator for TCS, the authors examine MRI of repaired sites.
Results: On MRI, other than low-lying conus medullaris and adhesions of the spinal cord on the dorsal dural sac, pseudomeningocele was demonstrated in 11 patients(22 %). Pulsating of the skin over pseudomeningocele was visible in patients without CSF shunting. Chief complaints of 11 patients were motor impairment and pain. After untethering preoperative neurological deficits ameliorated to a great extent.
Conclusion: MRI findings of pseudomeningocele at the site of previous MMC repair will be an early diagnostic indicator and untethering will be recommended.

0018

Closed Neural Tube Defects in children with Multisystem Malformations and Caudal Regression Syndrome

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Introduction: Children born with caudal agenesis have varying forms of closed neural tube defects(cNTDs) accompanying complex multisystem abnormalities. We reviewed our institutional experience in managing occult spinal dysraphism(OSD) in patients with progressive neurological symptoms.
Methods: Under an IRB approved protocol, children who presented with congenital malformation syndromes and symptomatic OSD were identified. Five children with caudal agenesis associated with asymptomatic OSD discovered incidentally on imaging were excluded.
Results: Twenty one children(8 female) meeting the above criteria were identified. Patients included ten cases of VACTERL, two cases of OEIS, one case each of Klippel Feil, Noonan's, Pallister Hall, Prune Belly & cytochrome C oxidase deficiency syndrome.Four children had miscellaneous congenital vertebral segmentation defects associated with various multisystem anomalies. Major presenting neurological symptoms were progressive motor loss in lower extremities(13), worsening of bladder function(5) and pain in lower extremities(2). Only one patient presented with a cutaneous marker in the from of a skin tag. Spinal lesions included lippomatous malformation of the cord(10), low-lying coni with thickened filum terminale(12), thoracic myelomeningoceles(4) & vertebral segmentation anomalies(10). Surgeries performed were tethered cord release(14), repair of meningocele(4) and myelotomy for syrigomyelia(4). Mean age at surgery was 24 months(range: 14 days to 114 months). There was only one instance of re-tethering.
Conclusion: Progressive weakness in the lower extremities and deterioration in bladder control were the most common neurlogical symptoms prompting surgical intervention. The relative absence of cutaneous markers in this patient population with cNTDs makes it imperative to evaluate children born with such congenital anomalies to undergo evaluation of the spine.

4. Craniofacial – Oral Presentation

0047

Sagittal synostosis: is it just cosmetic surgery? risk for chiari 1 malformation in untreated cases

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There are still many discussions about the indications (cosmetic or functional) and the technique (suturectomy versus open surgery) for surgical treatment in sagittal synostosis (SS); also the results are matter for debate, especially concerning neuropsicological outcome and volume correction. Chiari 1 Malformation (CM1) is a well known association with complex craniosynostesis, but it has been reported quite rarely in association with simple synostosis, both untreated and operated. The presents study reports 12 cases of SS, untreated for misdiagnosis, that were diagnosed between 6 and 15 years by RM for the occurrence of a symptomatic CM1: the clinical evidence of a cranial deformation induced to perform a late volumetric CT scan, that documented the a complete absence of the sagittal suture, in presence of the indentation of all the other sutures. All were submitted to a genetic study, that ruled out a complex craniosynostosys. 3 cases presented mental retardation, 1 deep visual defect due to ICP and 10 had late occurrence of symptomatic CM1, deserving surgery and so Craniovertebral Decompression was performed; 6 had an associated syringomyelia, cured by the decompression. 1 needed hydrocephalus shunting The CT scan ruled out nonsynostotic dolicocephaly and was useful also for the late diagnosis of SS. The early SS correction may has also a functional meaning, if it prevents the late occurrence of CM1. The results of different surgical techniques for scaphocephaly should be always evaluated at a long term, not only by their cosmetic results, but also by their functional effect, especially preventing CM1.

0055

Complications and Pitfalls in Frontoethmoidal Encephalomeningocele Surgical Repair: What did I do wrong?

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Introduction: Frontoethmoidal encephalomeningocele (FEEM) cases that warrant surgical repair is still prevalence in Indonesia. But, complications may follow, temporarily in some, and permanently in others. Pitfalls need to be reported to refine the surgical techniques and avoiding the complications.
Methods: Medical records of FEEM patients treated in two hospitals were reviewed. Complications were documented and categorize as intracranial complications, CSF-, skin-, and eye-related as well as cosmetic result.
Results: Records of 200 patients were reviewed. Complications were found in 34 (17 %) cases, mostly related to cerebrospinal fluid dynamic. Pseudotumor (benign intracranial hypertension) were encountered in 5 patients, CSF leakage in 6, and progressive hydrocephalus in 3 cases. Skin and wound related problems were encountered in 7 cases i.e skin breakdown causing exposed of the bone graft in 4, and 2 cases of exposed implant, skin infection without exposed of the bone or implant in 2 cases. Eye related problems were found in a form of diplopia in 1, post-operative epyphora in 2, OND (Obstructive Nasolacrimal Duct) in 4. Unacceptable cosmetic results were found in 8 patients (discoloration and hypertophic scar). Possible causes of the complications were big or huge FEEM, pre-operative intracranial anomaly, gliotic mass that adhered to surrounding tissue, inflammatory respons due to excessive manipulation, very thin skin, tissue reaction to implant used or suture, and history of hypertophic scar.
Conclusions: Complications and pitfalls in frontoethmoidal encephalomeningocele surgical repair are still unavoidable in particular cases. Experience and knowledge to the potential pitfalls might help to reduce avoidable complications.

0108

Objective follow up data after craniosynostosis surgery with non-radiological scan techniques

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Introduction: Objective follow up information after craniosynostosis treatment consist of surgical and clinical findings. Beside complications, cosmetic outcome and functional aspects objective morphometric data are useful parameters. This series investigates the benefit of non-radiological scans for morphometric follow up.
Methods: Single unit prospective series of craniosnostosis cases with pre- and postsurgical (6 and 12 months) scan measurements regarding cephalic index (CI) head circumference, volume, cranial base and symmetry. Photo- and laserscan techniques are tested. Surgical technique (open and minimally invasive), complications and cosmetic evaluation are additionally monitored.
Results: 168 craniosynostosis cases (15 syndromic) were operated between 2007 and 2′2012. The most frequent deformity was sagittal synostosis (48.9 %) followed by metopic (25.6 %), unilateral coronal (10.1 %), bilateral coronal (6.5 %) and syndromic (8.9 %). 26 minimally invasive procedures, 15 redos were performed. CI did not reach normal values in bicoronal and metopic craniosynostosis, best values were obtained at 6 months follow up. Volume increased proportional and symmetry was stable in asymmetric deformities.
Conclusion: Modern scan techniques provide useful and objective morphometric data for craniosnostosis follow up after surgery and obviate the need for radiation exposure in these young patients.

0090

Use of cranioplasty materials in children – are we doing more harm than good?

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The authors recently reviewed our surgical practice an in addition did a literature review on various implantable cranioplasty materials. Over the last forty years, craniofacial surgery in general and surgery for craniosynostosis in particular has witnessed the introduction of a number of new materials for use in operations involving the cranial vault. Some of these materials have proven quite useful over time while others have clearly failed to meet their stated objectives. In this presentation the more popular implant materials are analyzed and their relative merits and drawbacks are delineated. As this review will detail, the use of stagnant, non-growing, non-biologic metallic and bioceramic implants have thus far yield disappointing or inconclusive results in the pediatric population. Long-term follow-up reveals a high failure rate in these implants due to infection, extrusion, migration and fracture. Craniofacial surgery and in particular cranioplasty in the pediatric population has its own unique limitations, quite different from the adult population and those issues will also be discussed. Over the last forty years, craniofacial surgery in general and surgery for craniosynostosis in particular has witnessed the introduction of a number of new materials for use in operations involving the cranial vault.

0301

Skull base changes after distraction osteogenesis for treating unilateral coronal craniosynostosis

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Objectives: The early closure of cranial suture is caused by cranial base malformation, this hypothesis has been accepted as a theory for craniosynostosis and craniofacial anomaly. Conventional reposition surgery for craniosynostosis can reshape cranial vault morphology but craniofacial asymmetry can recur years after operation. The authors hypothesized that distraction of the skull base might cause stress on the skull base that could modify skull base angulations deformities and reconstitute a normal suture.
Methods: The study recruited 24 unicoronal craniosynostotic patients, of whom 12 underwent distraction treatment and the other 12 underwent traditional treatment. The distraction technique was compared with traditional bone repositioning techniques for remodeling skull base axis deformities in synostotic plagiocephaly patients.
Results: Both approaches resulted in successful outcomes in terms of exocranial morphology correction, but distraction technique may offer some advantages over traditional methods; 1) distraction did modify the skull base angulation and the endocranial morphology 2) distraction could reconstitute suture at the region of craniosynostosis. The average correction of skull base angulations with distraction was from 164.6 to 174.3 degrees, whereas the correction for the traditional technique was from 165.2 to 166.2. The amount of change in skull base axis was statistically significant according to the Mann-Whitney test ($p<0.001$), but the change in cranial index of asymmetry was not ($p=0.363$).
Conclusions: The skull base axis in synostotic plagiocephaly showed the greater correction using the distraction method. Cranial base malformation in craniosynostosis can be treated advantageously by distraction osteogenesis than conventional surgery

0105

Long-Term Outcomes following Extended Sagittal Synostectomies

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Introduction: While approaches to surgical correction for sagittal synostosis are variable, ranging from endoscopic to total calvarial reconstruction and include extended synostectomies (Pi procedure), there is a paucity of objective long-term outcome data. We reviewed our experience for isolated sagittal synostosis over 14 years at a single institution to evaluate objective criteria for improvement and longevity of correction.
Methods: Infants with isolated sagittal synostosis who underwent Pi procedures from 1997-2011 at CNMC were evaluated by pre and postoperative cephalic indices, head circumference percentiles, and morbidity / mortality.
Results: Thirty of 79 infants (38 %) who underwent Pi procedures had both pre and postoperative cephalometric data over an average follow-up of 45.0 months. Average surgical age was 5.3(2.6-11.5) months. Operative duration was 1.4 ± 0.4 hours and hospital length of stay was 2.3 ± 0.5 days. Average cephalic index preoperatively was 68.7 ± 4.1, which significantly improved to 72.8 ± 4.4 postoperatively($p<0.001$) and remained constant over follow-up. Median head circumference

preoperatively was *90.5*, stabilizing to *89.0* postoperatively(*p=1.00*). 5/79 patients(6.3 %) underwent a major reoperation between 12-60 months after the primary surgery; indications included scapho-trigonocephaly(n=2), biparietal narrowing, frontal/occipital bossing, and intracranial hypertension. There were no minor reoperations or mortalities.
Conclusions: Extended sagittal synostectomies (Pi procedures) secure appreciable correction of scaphocephaly that persists over time. This is concomitant with a stable head circumference. In the setting of a low reoperation rate and no appreciable morbidity or mortality, the Pi procedure should be considered a credible surgical therapeutic option for scaphocephaly,particularly when compared to endoscopic approaches.

0294

Bifrontal / unifrontal advancement : technical variation

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For plagiocephaly and bicoronal synostosis standard advancement techniques are described. We have used a variation of technique for unifrontal advancement for plagiocephaly, mainly by contouring the forehead with a similar piece of bone elsewhere in the skull or by overlay technique. Similarly, this technique was also used for bifrontal advancement. Absorbable screws and plates were occasionally used in addition to sutures. Experience of 21 patients treated with this method has given a satisfactory result in all cases in the immediate post operative period as well as over 3 years mean follow up.

0136

The First 168 Cases of Trans-sutural Distraction Osteogenesis in Craniosynostosis Surgery during last 3 years

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Introduction: The authors presented a novel trans-sutural distraction osteogenesis (TSuDO) method for the treatment of all types of craniosynostosis, which consisted of simple suturectomy of the pathologic suture followed by direct distraction only of the suturectomy site. However, only small numbers of TSuDO were presented during last 2 years and therefore we present updated data after 36 months' experience.
Methods: One hundred sixty eight children received TSuDO, and the simple craniosynostosis group (SCG) were 135 patients, and the multiple and syndromic craniosynostosis group (MSCG) were multiple craniosynostosis in 11 and syndromic in 22. Mean age was 20± 24 months.
Results: The mean operation time was 132±57 minutes (SCG 118 ±49 vs. MSCG 162±60), mean total transfusion volume of blood components 103±103 ml (SCG 85±97 vs. MSCG 145±108). Successful correction of the abnormal head contour only after distraction was observed in all patients, and perioperative complications comprised of 1 case (0.6 %) of transient cranial nerve palsy, 5 cases (3.0 %) of distractor breakage and 10 cases (6.0 %) of minimal pus discharge
Conclusion: We reconfirmed that TSDO is easy, safe and an effective method in the treatment of all types of craniosynostosis especially when the patient with simple craniosynostosis is of a younger age less than 2 years.

0236

Severe flattening of the back of the had: The role of posterior calvarial augmentation in occipital brachycephaly

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In brachycephaly with shortening of the fronto-occipital skull diameter, the most often performed surgical procedure is FOA. When the forehead is prominent, an enlargement of the posterior calvaria is a good option to correct the head shape.
We have developped a surgical technique of posterior calvarial augmentation without the use of plates or screws and avoiding the formation of free bone flaps.
The procedure was applied in six infants at the age of 17 to 142 (median, 21) months; four of them were<1 y. The diagnoses were Mercedes-Benz syndrome in four, Kleeblattschädel (FOA 3 years before) in one and excessive posterior plagiocephaly in one patient. Calvarial bone strips (2 cm) were build with the craniotome, parallel to the sagittal suture or to the transverse sinus. They stood with their base at the calvaria, alternatively towards the one or to the opposite side. They were elevated, bent in a manner to expand the posterior calvaria and fixated with absorbable 2.0 sutures. This resulted in an eventual distance between bone and dura of up to 3 cm.
There were no intra- or postoperative complications. The posterior skull flattening was sufficiently corrected in all cases, the amelioration of the head shape was convincing also in the long term. A postoperative helmet therapy was not necessary.
The proposed surgical technique is feasible, effective, and is recommended for infants with strong occipital flattening. The avoidance of foreign implants or of the formation of free bone flaps is of advantage.

0175

Frame-Based Cranial Reconstruction

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The repeated exploitation of anatomical knowledge by phrenologists, criminal anthropologists and authors of racial theories to justify various types of discrimination has, over the course of history, resulted in horrific crimes against humanity, including the Holocaust. To date, this historical burden has hindered progress in establishing an unprejudiced approach toward aesthetics. With regard to surgery specifically, the decision-making process still depends largely on the highly subjective aesthetic perception and personal background of the individual or team performing such surgery. Moreover, this dilemma also applies to molding helmet therapy as the need for definitive aesthetic criteria is simply transferred from the surgeon to the helmet manufacturer.
To escape from this dilemma, the objective of this study is to provide a surgical tool to translate objective statistical information (rather than subjective aesthetic criteria) into a frame-based technique used for cranial remodeling. A 3-D library of virtual skull reconstructions, based on MRI data sets, was established in a preliminary study in 2005, which provided customized statistical stereolithographic models for surgery. In 2010, a prototype of a rotating surgical frame (German Patent 102004020020/ US 11/ 578,822) was added to improve the

application of the physical model. In 15 surgeries, the intended aesthetic result was reached in every case at first go. The goal of this technique is not only to guarantee a certain aesthetic result, but also to reduce the length of the surgery, limit blood loss and decrease the overall stress associated with the procedure.

0261

The chronological changes in surgical method, and the comparison of treatment costs and hospitalization periods between conventional and distraction osteogenesis for non-syndromic craniosynostosis

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Introduction: We introduced distraction osteogenesis for craniosynostosis from 1999, and we reported that this process is less invasive due to less bleeding and a shorter operation time compared to conventional cranioplasty (Pediatr Neurosur 2006). We believe that this method works especially well for syndromic craniosynostosis because of further skull advancement. In this study, we analyzed chronological changes in choice of surgical method for non-syndromic craniosynostosis, and we compared the age of diagnosis and operation, hospitalization period, and treatment costs between the two methods.
Methods and results: We operated on 15 patients by distraction osteogenesis, and on 6 patients by conventional cranioplasty between the years 1999 and 2011. Until 2004, we treated the initial 11 patients by distraction. From 2005, 4 patients were treated by distraction and 6 patients by conventional cranioplasty. We compared the 2 groups treated from 2005. The age of diagnosis and treatments were late in the distraction group. The hospitalization periods were 26.5 days in the distraction group and 16.5 days in the conventional group. The treatment costs were 34,000 USD and 26,000 USD in each group, respectively. The distraction group needed significantly higher hospitalization fees and longer admission periods.
Conclusions: 1) The patients with severe deformity were diagnosed and operated on at younger ages by conventional cranioplasty. 2) Distraction osteogenesis was less invasive, but needed higher hospitalization fees and longer admission periods. We have to select the treatment methods according to invasiveness, treatment costs and severity of deformity.

5. Hydrocephalus – Oral Presentation

0276

National audit of ventriculoperitoneal shunt survival in children in the United Kingdom

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Introduction: Ventriculoperitoneal (VP) shunt survival in children has significant implications for the morbidity and mortality of this cohort of children and for the provision of paediatric neurosurgical services. The aim of this study is to report on a national scale the VP shunt failure rate for newly placed and revised shunts and to introduce the 30-day failure rate as a marker of surgical outcome.
Method: Retrospective national study of neurosurgical units in the United Kingdom and Ireland. All paediatric patients (<16 years) undergoing any VP shunt operation (insertion of new shunt or revision of existing shunt) in the period January 2008-January 2010 were logged onto a central database.
Results: 2359 operations were recorded of which 1045 were insertion of a new shunt. Overall cumulative survival was 0.7 and 0.55 for new and revised shunts respectively.
30-day and 1-year failure rates for new VP shunts were 12.8 % and 27 % respectively. This data for all revised shunts were 23 % and 37.6 % respectively. This data for first time revisions (i.e. subsequent revisions on the same patient excluded) were 21.3 % and 35.9 % respectively. Comparison of those operations performed by a paediatric and non-paediatric neurosurgeons suggested significantly better failure rates for the former for revised shunts only, no significant differences were seen for new shunts.
Conclusion: The 30-day failure rate may be a better barometer of surgical outcome for patients with VP shunts. Better shunt survival is seen when procedures are performed by consultant paediatric neurosurgeons although these differences are significant for revised shunts only.

0163

Pathophysiology of shunt dysfunction in shunt treated hydrocephalus

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Introduction: The hypothesis for this study is that different pathophysiological mechanisms exist depending on whether the cause of shunt dysfunction is the ventricular catheter or the valve. In order to investigate this we examined cytology and histology of removed shunt material with purpose of proposing a novel causal classification of shunt obstruction.
Methods: Aetiological (hydrocephalus type, shunt type, implantation time etc.) and surgical (obstruction site, catheter adherence etc.) data were collected by reviewing patient files and surgical descriptions. Removed shunt material was fixed with formalin. Macroscopic tissue in the shunt was examined using HE-staining and immunohistochemistry (GFAP, neurofilament, CD68 etc.). In order to detach macroscopically invisible biomaterial for examination, remaining shunt material was incubated 5 min. with trypsin, then flushed with PBS for centrifuging (5 min., 3500RPM). The pellet was resuspended for cytospinning and examined likewise.
Results: Preliminary data show a different mechanism in shunt dysfunction due to catheter obstruction versus valve obstruction. In a minority of cases a macroscopic tissue plug of reactive gliosis inside the catheter causes shunt dysfunction. The remaining cases of shunt dysfunction in this study are either caused by a squeezed in catheter or valve obstruction. Cytospins of dysfunctional valve contents suggest a primarily inflammatory pathophysiology. Final data of this ongoing study will be presented.
Conclusion: Our preliminary results suggest that shunt obstruction may be caused by different pathophysiological mechanisms. We expect that this will lead to a deeper understanding and therefore ultimately to better strategies to prevent shunt obstruction.

0017

Longterm, positive outcome of hydrocephalus and V-P shunt

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Few studies studied the long term, positive outcome of hydrocephalus and V- P Shunt. We performed a retrospective study for all the patients, who had been diagnosed and received V-P Shunt in King Fahd Hospital of the University for more than 11 years ago. 274 patients had been included in this study. The eldest received the shunt in 1987. All these patients have been treated by one team. The criteria for positive long-term outcome include;

- 1. Average or above average IQ
- 2. Quality of life,Continued studied and have regular job
- 3. Normal family and social life
- 4. Normal cognitive function

57 patients had been found to fit with these criteria. CT- Scan or MRI has examined them. The files have been examined to find out the causes of hydrocephalus, prematurity, time of shunt, post shunt complications, shunt revision and the associated congenital anomalies.
20 of them have been intensively studied by different psychological examinations such as ; General Intelligence, visual speech, visual memories, constructive skills and verbal memories. Attention tests had been carried as well. The results showed that 4 patients have impaired constructive skills. 7 have impaired verbal fluency. All have average or above average IQ and normal verbal memory and recognition.
Preliminary conclusion: Positive long term outcome of hydrocephalus and V-P shunt can be expected for at least 17 % of the hydrocephalic patient. This kind of patient may have good quality of life, steady job and good social and family life.

0135

Ventriculoperitoneal shunt survival in children who require additional abdominal surgery - are our estimations of the additional risk accurate?

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Introduction: Children with ventriculoperitoneal shunts (VPS) may require abdominal surgery for other reasons. Our study investigates the effect and timing of abdominal interventions on VPS survival.
Methods: Data on all children undergoing primary VPS insertion or revision over a two-year period (1/1/08 - 31/12/10) were reviewed. Two groups were compared: those undergoing shunt surgery only (SO) and those who also had additional abdominal surgery (AS). Data analysis was performed using Kaplan-Meier curves, log rank and chi-squared tests.
Results: 342 shunts in 109 patients were included. 20 patients contributed 118 shunts to the AS group. Median shunt survival was 22.6 months (95 % CI=8.76-36.4) in the SO group compared to 3.68 months (95 % CI=1.01-6.47) in the AS group (log-rank 16.6, $p<0.001$). Additional abdominal interventions increased the risk of shunt failure by 54.7 % per abdominal procedure ($p<0.001$). Shunt failure due to infection was 60 % higher in the AS group compared to the SO group ($P<0.001$).
If abdominal interventions occurred within one year of shunt surgery, median shunt survival was 1.48 months (95 % CI=0.00-3.09, $p<0.001$). Beyond one year, median shunt survival increased five-fold to 7.65 months (95 % CI=0.00-20.1, log-rank=23.2, $p<0.001$). The risk of shunt failure decreased by 29 % for every year interval between the two procedures (95 % CI=0.11-0.44, $p<0.005$).
Conclusion: Additional abdominal surgery increases the risk of VPS failure. The risk of failure decreases as time between shunt surgery and abdominal surgery increases. Patients undergoing abdominal interventions have a higher chance of VP shunt failure due to infection.

0243

Pharmacological regulation of aquaporin-4 in experimental hydrocephalus

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Introduction: Experimental studies confirm a functional role for the cellular water transport protein aquaporin-4 (AQP4) in brain diseases with disturbed CSF circulation. As part of our long-term goal to find secondary treatment modalities for hydrocephalic children, we hypothesized that regulating AQP4 levels in the hydrocephalic brain influences the outcome of the disease.
Methods: Using a kaolin model of obstructive hydrocephalus in adult rats, AQP4 expression was characterized in untreated animals and after continuous intracerebroventricular delivery of vasopressin, a vasopressin antagonist and vehicle (n=8 each) via osmotic micropumps. Ventricular volume was quantified by MRI before and after treatment. Brain tissue was analyzed by western blotting, immunohistochemistry and immunofluorescence.
Results: In the untreated hydrocephalic rats, AQP4 was significantly decreased in the periventricular region after two days (n=10) (control: 1.00, 0.95-1.04; two day: 0.78, 0.63-0.084, $p<0.05$), normalized after one week (n=10) and increased after two weeks (n=10) (control: 1.00, 0.88-1.21; two weeks: 1.40, 1.27-1.64, $p<0.05$). Double immunofluorescence (AQP4+GFAP, AQP4+Lectin) confirmed known cell-type specific expression of AQP4 in astrocytes and ependymal cells. Preliminary *ex-* and *in-vivo* MRI confirmed that the osmotic pumps were reliable and the method reproducible. Gadolinium delivered via micropumps was present 24 h post-implantation. The pharmacological intervention studies are ongoing and the outcome data will be presented.
Conclusions: Our preliminary data show changes of AQP4 in the hydrocephalic brain and confirm usage of osmotic micropumps in our model. We expect that this model will help determine if AQP4 can be a future drug target in the treatment of hydrocephalus.

0194

Surgical complications of lumbar csf drainage

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Introduction: Patients requiring temporary or permanent CSF diversion are constantly at risk for both overdrainage and underdrainage as we disrupt the normal balance of CSF dynamics. Intracranial drains and shunts have a well documented set of complications related to overdrainage (including subdural hematomas, intracranial hypotension, and

slit ventricle syndrome) and underdrainage (elevated intracranial pressure, cerebral ischemia, and sudden death). Temporary lumbar drainage or lumboperitoneal shunting have contentious indications, as well as their own set of troubles. In honour of the conference theme of *Surgical Complications*, we would like to report on our series of significant complications in the use of both lumboperitoneal shunts and external lumbar drains.
Methods: Institutional retrospective review of surgical and treatment complications related to temporary lumbar drainage and lumboperitoneal shunting in pediatric patients. Indication for lumbar drainage or shunting as well as complications and subsequent management will be discussed.
Results: In our 10-year retrospective review, significant complications have largely been related to insertion and overdrainage. Insertional complications have included direct spinal cord injury, vascular injury leading to a spinal arteriovenous fistula, and CSF leaks. Overdrainage has caused acute life threatening events due to cerebellar impaction within the foramen magnum and brainstem compression, as well as chronic iatrogenic cerebellar descent.
Discussion: Complications related to lumbar CSF drainage and shunting are common, and often due to overdrainage rather than underdrainage. The indications and use of lumbar drainage needs to be well thought out to justify these risks.

0240

Effect of delayed ventricular drainage on ventriculomegaly and neurological deficits in experimental neonatal hydrocephalus

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Evidence-based practice guidelines do not indicate when ventricular reservoirs should be placed in children with neonatal hydrocephalus; therefore delayed intervention is common. We hypothesize that delayed ventricular drainage in neonatal hydrocephalus has an adverse effect on structural development and functional outcomes. Using a well-established animal model of kaolin-induced obstructive hydrocephalus, we evaluated neurologic deficits in animals after Early or Late placement of ventricular reservoirs, 1- or 2-weeks post-kaolin, respectively. Reservoirs were tapped according to strict neurologic criteria. Maximum ventriculomegaly was similar in both Early and Late groups. The average neurologic deficit scores (NDS) over the entire experimental period were 0 (n=6), 2.74 (n=5), and 2.01 (n=3) for Control, Early, and Late groups, respectively. At reservoir placement, Early group animals displayed enlarged ventricles without neurologic deficits (mean NDS=0.17) while the Late group displayed ventriculomegaly with obvious clinical signs of hydrocephalus (mean NDS=3.13). The correlation between severity of ventriculomegaly and NDS in the Early group was strongly positive in the acute (to 3 weeks post-reservoir; R^2=0.65) and chronic (6 to 12 weeks post-reservoir; R^2=0.65) phases, while the Late group was less correlative (acute R^2= 0.51 and chronic R^2=0.19). Current practice tends to favor delayed reservoir implantation until signs of elevated ICP and neurologic deficit appear. Our results demonstrate that (1) animals in Early and Late reservoir groups undergo the same course of ventriculomegaly, (2) tapping of reservoirs in these neonatal hydrocephalic animals based on neurologic deficits does not halt progressive ventricular enlargement, and (3) neurologic deficits correlate strongly with ventricular enlargement.

0099

Complications of treatment in 412 hydrocephalic patients

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Introduction: The best therapeutic management for infantile hydrocephalus is not always obvious. Traditionally shunt insertion has been performed when CSF dynamics have been considered abnormal. There are several complications for this procedure.
Method: We treated 412 hydrocephalic children who undergo different types of operations for this disease and their ages ranged from newborn up to17 years. The surgical technique was a VP shunt for 275 cases, VA shunt in 35 patients, VP shunt in 14, and Ventricle gallbladder shunt on 12 cases. Completed the study 76 patients treated by endoscopic third ventriculostomy (ETV) for no communicating hydrocephalus. The clinical records, surgical protocols, radiologic studies and follow up are reviewed. The follow up period was 10 years.
Results: 41 % in our study (172 patients) suffering different type of complications. The complications were in relation with the age and the type of procedure. The main complications in the shunts group were intraventricular hemorrhages and neonatal sepsis. 31 cases have a multiloculated hydrocephalus as a complication and we need to remove the shunt in 41 children. In this study we have complication in only 8 % of neuroendoscopical procedure like mild hemorrhage, meningitis and CSF leakage. Follow-up ranges from 10 years to 3 years in the last case considered.
Conclusion: Hydrocephalus is very common diseases on Pediatric neurosurgical practice. Its required several treatments with multiples complications

0144

Defining decision rules for ventriculo-subgaleal shunt placement

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Introduction: Using a previously reported series of Ventriculo-subgaleal shunts (VSGS) we have attempted to derive a decision rule for the timing of shunt placement. This report concentrates on the value of Evans' Index.
Methods: We reviewed the records of all patients receiving a VSGS from 5-1-07 to 1-31-11.We abstracted patient demographics, the etiology and laterality, rates of complications and interval between VSGS and shunting. Evans' index was calculated for all head ultrasound examinations performed before placement of the first VSGS. Absolute values, rates of change, linear and polynomial regression equations were calculated.
Results: Median gestational age for VSGS placement was 27.3 weeks. All patients had suffered neonatal IVH. Median time from hemorrhage to VSGS was 21 days. Mean age at time of VSGS placement was 23 days. Median Evans' Index on the first ultrasound was 0.36. Median Evans' Index on the last ultrasound before shunt placement was 0.55. Absolute values of Evans' index did not produce a clear decision rule. Neither linear nor quadratic regression provided a clear decision point. The greatest change in Evans' index occurred between the second-to-last and last ultrasound examinations.
Conclusions: Many factors are involved in determining the timing of VSGS placement. A simple measurement, such as Evans' index, while

highly correlated with the decision to place a shunt cannot be a determining factor. Our data suggest that there may be an opportunity to arrive at the shunt placement decision earlier than we currently do, but more detailed examination of other variables affecting the decision is required.

0179

Smartphone assisted placement of ventricular catheters

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Objective: Free-hand placement of ventricular catheters (VC) is reported to be inaccurate in 20-40 %. Ultrasound or neuronavigation are used in selected cases with significant technical and time consuming efforts. We developed a smartphone-assisted guiding for the placement of VC.
Methods: Measuring of relevant parameters in 3D-MR-datasets of 21 patients with narrow ventricles for individual frontal VC placement was performed. In this context a guide was developed to apply accurate VC placement. The guide was tested in an agarose model to quantify placement precision followed by CT imaging. A smartphone application was developed to assist the relevant measurements in patients. The guide was applied in 27 patients (15.2±17.9 yrs) for VC placement.
Results: While using a rectangular approach in the sagittal plane, the angle towards the tangent in the coronal section was defined as relevant individual parameter for correct VC placement. The angle ranged between 91.96 ±2.75° to 99.56±4.14°, which was stable also in laterally shifted (±5 mm) entry points. The subsequently developed guide's precision resulted in 1.1±0.7° angle deviation and 1.6±0.8 mm tip deviation at a length of 7 cm. Using the smartphone assisted guide in patients with mean FOHR of 0.39±0.06 a primary, successful cannulation of the ventricles was possible in 100 % of cases. With a follow up of 6.7± 4.3 months no VC failure was observed.
Conclusions: VC placement in narrow ventricles requires accurate placement with simple means in an every-case routine. The simple smartphone assisted guide meets these criteria. Further data are planned to be collected in a prospective randomized study.

0209

Ultra-early shunt failure - incidence and etiology

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Background: Nearly 40 % of shunts fail during the first year of insertion. We studied the hypothesis that ultra-early shunt failures (less than one week) are the result of technical factors possibly related to surgical technique.
Methods: A retrospective cohort analysis was carried out over a four year period. Each new placement or shunt revision was treated as a unque episode with chance for failure or success amongst all patients aged zero to 18 years at the time of shunt surgery. The charts were reviewed for time of failure and cause of failure and demographic data was abstracted.
Results: Three hundred and forty two occurences of shunt surgery were identified. The incidence of ultra-early shunt failure was 14 %. Ultra-early failure was twice as common in a shunt revsion when compared to initial placement (p=0.01). The principal causes were bleeding, unrecognized distal obstruction and slit ventricles with capsule causing repeated ventricular catheter obstruction. There was no gender difference.
Conclusion: Although the vast majority of shunt failure is due to hoat (patient) related factors the incidence of ultra-early failures may be related to technical factors which can be prevented.

0131

Allergic sensitization caused by ethylene oxide-sterilized implants

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Background: Ethylene oxide (EO) is an alkylating agent widely used in gas-sterilization of medical equipment such as intravenous tubing, dialysis catheters and shunt tubing. It has previously been reported as a cause of severe allergic reactions in dialysis patients, and in patients with spina bifida.
Methods: Following discovery of EO sensitization and clinical allergy in a hydrocephalus patient with multiple shunt revisions, we investigated a further five consecutive patients with hydrocephalus and multiple shunt revisions; all of whom displayed chronic malaise and clinical signs consistent with shunt dysfunction without signs of mechanical shunt failure.
Results: All six patients had IgE antibodies against EO in serum, and three of them had displayed local and/or systemic allergic symptoms on exposure to EO, though only two had spina bifida. Five patients underwent surgery performed in a latex free and EO minimized environment to remove or replace all EO sterilized shunt material. They all showed signs of improvement on short term follow-up (weeks) and long-term follow-up is planned.
Conclusion: Our results suggest that spina bifida per se may not be the common factor increasing the risk of EO sensitization and clinical allergy. Rather, the common factor may be the long-term implantation of and repeated exposure to EO sterilized materials such as shunts. If allergic sensitization is indeed a risk of implanting EO sterilized equipment in patients, it may have much wider implications for the long term risk associated with shunt surgery.

0265

The british antibiotic and silver impregnated catheters for ventriculoperitoneal shunts multi-centre randomised controlled trial (the basics trial)

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Infection remains a major cause for morbidity in the treatment of shunted hydrocephalus. Class I evidence for using impregnated catheters still eludes us.
Design: Three-arm, multi-centre phase III randomised controlled trial studying standard, bactiseal and silver impregnated catheters.
Target population: Children and adults with newly diagnosed hydrocephalus requiring a VPS.
Primary outcome: Time to first VPS infection

Secondary outcomes: Time to shunt failure of any cause; Reason for shunt failure; Types of bacterial VPS infection (organism, antibiotic resistance); Time to VPS failure following first clean revision; Incremental cost per VPS failure; Incremental cost per QALY gained; To improve the diagnostics of suspected shunt infections through molecular diagnostic approaches
Statistical methods: A Bonferroni adjustment has been made to allow for the multiple comparisons and a statistical significance level of 0.025 will be used. Sample size calculation is based on Pintilie 2002. Allowing for 5 % loss to follow up a sample size of 1200 participants allows a hazard ratio of 0.49 to be detected over a range of baseline event rates (0.05 to 0.1) with good statistical power.
A feasibility study demonstrated the commitment of sites to the study and supports an annual eligible participant figure of 1200. Using a conservative estimate of 50 % consent rate, this sample size will be achievable over a 2-year recruitment period.
Conclusion: This will be the first prospective muticentre randomized study designed to establish evidence for the health economic effect of impregnated catheters and their role in reducing shunt infection.

0206

Managing sustained intracranial hypertension after csf diversion: cranial vault expansion

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Introduction: Intracranial hypertension after early shunting is a rare but morbid sequelae of hydrocephalus. When the brain and skull have failed to grow in synchrony (due to CSF diversion) there is often little compliance nor tolerance of shunt failure. When intracranial hypertension is refractory to shunting, we propose proceeding with cranial vault expansions.
Methods: Retrospective review of 8 children who underwent cranial vault expansion for management of post-shunt intracranial hypentension. All patients were initially shunted for hydrocephalus in infancy (secondary to tumor, spina bifida, IVH) and subsequently developed symptomatic increased intracranial pressures as measured by ICP monitor despite a working shunt. The vault expansion was originally performed as a unilateral hinged frontotemporoparietal osteoplastic flap, however over the last 5 years it changed to an outer table frontotemporoparietal flap with less hinging.
Results: All 8 patients demonstrated 'slit ventricles' and pre-expansion head circumferences (HC) less than 50 % (decreased from birth HC). Five patients required unilateral expansion, 3 patients required bilateral (2 initially, 1 in follow-up). Post-expansion HC were larger by at least 1 cm. ICPs normalized within three days post-operative in 5/8 patients (without dural splitting). Improvement in ophthalamologic signs/symptoms was achieved in all 5 patients. There have been no post-operative shunt revisions (median 36 months).
Conclusions: Cranial vault expansion is useful in the management of intracranial hypertension associated with relative microcephaly from early shunting. Early recognition of intracranial hypertension, evaluation with ICP monitoring and vault expansion resulted in improvement of neurologic symptoms and relieved the need for further shunt revisions.

0280

Complications in the management of post-infective hydrocephalus

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Introduction: We have now adopted the practice of diagnosing post-infective hydrocephalus by testing for ventricular CSF by ventricular tap in infants with hydrocephalus , irrespective of imaging characteristics . It has become our recent practice to perform ventriculosubgaleal shunts as a prelude to performing endoscopic third ventriculostomy in these infants.
Methods: This study looked at a series of 85 infants with post-infective hydrocephalus studied prospectively over a 10 year period from 2001-1010 with this protocol.
The complications were looked for under the following headings: a)complications related to subgaleal shunts, b) complications related to endoscopic third ventriculostomy, and c)complications related to ventriculoperitoneal shunt. 79 of the patients underwent subgaleal shunting, 73 had an ETV, and 12 had ventriculoperitoneal shunts performed first whereas 15 had secondary VP shunts after ETV failure.
Results: Complications related to subgaleal shunts occurred in 10 out of the 79 patients who underwent the procedure in the study. These included blockage(5), extrusion (2), infection of the skin(1), and excessive subcutaneous collection(2). Complications related to endoscopic third ventriculostomy were perioperative complications like a)Lost within the ventricles and failure of the procedure (12/77), b) Bleeding (1/77) and c)failure to recognize a second membrane(1/77); postoperative complications included failure in 14/65. Complications related to shunts were divided into like blockage (4/27), migration (1/27), overdrainage (1/27), and infection (2/27).
Conclusions: Hydrocephalus following infections in infants is common in the developing world, and is difficult to treat. Complications occurred in over 50 % of our infants.

0133

Using of multiperforated shunt catheter as stent in children with complicated intracranial anatomical conditions

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Introduction: The goal of treatment of complex hydrocephalus and arachnoid cyst in children is endoscopic creation of communication between all intracranial csf compartments. However sometimes, due to complicated anatomical conditions, only endoscopic fenestration is not enough and we must secure our surgery. Using of multiperforated shunt catheter as a stent is a good solution.
Methods: In last four years we solved 12 children with complicated intracranial anatomical conditions, 8 with complex hydrocephalus and 4 with complicated arachnoid cysts. We combined endoscopic perforation with direct visual endoscopic control of intracranial catheter inserting through required compartments. We always used electromagnetic neuronavigation for selecting the ideal entry point and the best trajectory.
Results: We performed in total 15 surgeries in these 12 infants. In all complex hydrocephalus cases we successfully drained intracranial fluid collections from one approach with using of one catheter. In all arachnoid cyst cases we were successful with pure endoscopic solution and we secured fenestration by implantation of ventricular catheter. No permanent morbidity and mortality occurred in our series. We solved one postoperative csf fistula, one valve and one ventricular catheter obstruction.
Conclusion: Endoscopic procedure combined with accurate placing of intracranial catheter as a stent under visual checking allows solving most of the cases of complex hydrocephalus and complicated arachnoid cyst in children.

0152

Do antibiotic-impregnated shunts and peri-operative antibiotics decrease neonatal shunt infections? : A 10-year experience

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Introduction: A ventriculo-peritoneal (VP) shunt protocol was introduced 5 years ago (January 2007) in our unit mandating the use of antibiotic-impregnated shunt (AIS) catheters as well as cefotaxime and vancomycin cover for 48 hours in all neonates receiving a VP shunt. This study assesses morbidity and mortality following neonatal VP shunt insertion in the 5 years preceding and following the introduction of this protocol.
Methods: We conducted a retrospective case note review of all neonates who underwent VP shunt insertion at Princess Margaret Hospital for Children, Perth, Australia over the last 10 years (January 2002 to January 2012).
Results: Between 2002 and 2006, a total of 23 VP shunts were inserted out of which 5 (21.7 %) developed culture positive cerebrospinal fluid (CSF) infections necessitating shunt removal, prolonged antibiotic therapy followed by shunt revision. Between 2007 and 2012, a total of 15 VP shunts were inserted, with the new protocol, out of which 1 (6.7 %) developed CSF infection necessitating shunt removal ($p=0.37$).
Conclusions: Our results demonstrate a reduction in neonatal shunt-related infection rates from 21.7 % to 6.7 % following the introduction of AIS catheters and peri-operative antibiotic cover. In this small population, early results, although not significant ($p=0.37$) suggest promising short-term outcomes. Adequately powered studies as well as assessment of long-term outcomes are required.

0184

Third ventriculostomy using the Neuropen Device: a single surgeon experience over 18 years

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Introduction: Endoscopic third ventriculostomy (ETV) is an appropriate procedure in certain children with hydrocephalus but the procedure may be performed using the endoscope or alternatively the Neuropen. We hope to highlight the inherent advantages and disadvantages of the Neuropen device based on the experience of a single surgeon over eighteen years and highlight the lessons learnt and discuss our results.
Methods: We retrospectively analyzed 127 procedures on 106 patients spanning 1993-2011. Mean follow was 36.1 months (1-192 months). We analyzed criteria that led to successes in our cohort as well as outlined the specifics of the Neuropen regarding lessons learnt, learning curve, and predictors of success
Results: Based on the surgeon's early experience, changes were made as far as the type of ventricular catheter used and success improved from 56.8 % to 69.4 %. Complication rate was 5.5 %. The change in the catheter later in the series did not impact the overall success of the ventriculostomy. Success rate was 64.8 %, and the failure (patients requiring shunts) was 35.2 %
Conclusion: Despite the progressive standardization of indications for ETV, there has been no consensus on the instrumentation and technique to be used. We hope to highlight our results to using the Neuropen and why we feel it is safe and effective based on our experience.

0300

Aseptic meningitis: a troublesome complication following posterior fossa surgery

Status: Pending
Category: 6. Hydrocephalus

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Background: Posterior fossa surgery may be complicated by an inflammatory syndrome characterised by CSF pleocytosis and hypoglycorrhachia. Distinguishing this "aseptic meningitis" from bacterial meningitis may be difficult and is particularly important when the condition is further complicated by hydrocephalus.
Case Report: An asymptomatic 7 yo girl known to have NFI was found to have marked hydrocephalus due to an enhancing tumour of the dorsal midbrain. An endoscopic third ventriculostomy was performed and follow-up scan 6 months later showed resolution of the ventriculomegaly but further growth of the lesion. This was subtotally resected via a suboccipital transvermian approach. Six weeks after surgery the patient presented with a tense suboccipital pseudomeningocele with acute hydrocephalus on MRI.
Repeat endoscopy disclosed occlusion of the stoma which was re-opened. The pseudomeningocele recurred within 24 hours but decompressed during lumbar puncture (LP), which disclosed CSF pleocytosis (neutrophils 12/ul). Four further LPs over the following 9 days showed an ongoing moderate pleocytosis with raised protein and diminishing glucose, while direct aspiration of the pseudomeningocele disclosed a marked pleocytosis. All cultures were negative and intravenous ceftriaxone and cloxacillin were administered. The patient was discharged following resolution of the pseudomeningocele but returned four weeks later with abrupt recurrence of a tense mass. A ventriculoperitoneal shunt was inserted and she remains well on follow up one year later.
Discussion: The possible pathogenesis and investigation of this complication will be discussed, together with treatment options such as antibiotics and steroids. Lessons learnt in managing hydrocephalus in this setting will be considered.

6. Epilepsy/Functional – Oral Presentation

0277

Resection within rolandic cortex in paediatric epilepsy surgery- a challenge to classical viewpoint

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Introduction: In children with medical refractory epilepsy due to focal cortical dysplasia, resection of the epileptogenic cortical dysplasia provides the best opportunity for seizure freedom. This goal may not be achievable when the lesion involves Rolandic cortex due to the risk of permanent neurological and functional deficits.
We describe the results of three epilepsy patients with lesions in the Rolandic cortex. With careful case selection and a comprehensive epilepsy programme, it is possible to resect eloquent cortex and preserve function.
Method: Three patients were identified from our Children's Epilepsy Programme Database, who had epileptogenic foci localised to the

Rolandic cortex. (M: F=1: 2, age 4, 5, and 14). Their clinical notes as well as their magnetic resonance imaging (MRI), functional MRI, positron emission topography, and white matter tractography were retrospectively reviewed. Epilepsy management goals were carefully determined by correlating seizure semiology, with findings obtained from electrophysiological studies, and appropriate functional neuroimaging. Surgery utilised intra-operative electro-corticography to tailor the corticectomy including partial resections of the Rolandic cortex.
Results: All three patients had an immediate transient hemiparesis following surgery. These resolved completely at three months follow up. All three patients achieved excellent seizure reduction with continue gradual weaning of antiepileptic medications with follow up of 5, 12, and 18 months respectively.
Conclusion: Our experience demonstrates that with a careful perioperative epilepsy work-up, appropriate application of functional neuroimaging, and a comprehensive epilepsy and rehabilitation programme, it is possible to resect eloquent cortex and retain function without compromising the goals of epilepsy surgery.

0210

Functional recovery after injury of motor cortex in rats: effects of rehabilitation and stem cell transplantation in a traumatic brain injury model of cortical resection

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Experimental studies and clinical trials designed to help patients recover from brain injuries, such as stroke or trauma, have been attempted. Rehabilitation has shown reliable, positive clinical outcome in patients. Transplantation of exogenous neural stem cells (NSCs) to repair the injured brain is a potential tool.
This study evaluated the therapeutic efficacy of a combination therapy consisting of rehabilitation and NSC transplantation compared to monotherapy. A model of motor cortex resection in rats was used to obtain consistent and prolonged functional deficits. Results were evaluated using 3 methods during an 8-week period with behavioral test, motor evoked potential (MEP), and the degree of endogenous NSC production.
All 3 treatment groups showed the effects of treatment in the behavioral test, although the NSC transplantation alone group (CN) exhibited slightly worse results than the rehabilitation alone group (CR) or the combination therapy group (CNR). The latency on MEP was shortened in all 3 groups compared to the untreated group (CO). However, the enhancement of endogenous NSC proliferation was dramatically reduced in the CN group compared not only to the CR and CNR groups but also to the CO group. The CR and CNR groups seemed to prolong the duration of endogenous NSC proliferation compared to the untreated group.
A combination of rehabilitation and NSC transplantation appears to induce treatment outcomes that are similar to rehabilitation alone. Further studies are needed to evaluate the electrophysiological outcome of recovery and the possible effect of prolonging endogenous NSC proliferation in response to NSC transplantation and rehabilitation

0228

Deep brain stimulation for paediatric dystonia-dyskinesia: clinical experience of 106 cases

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Introduction: Dystonia-Dyskinesia syndrome (DDS) is a rare disease of childhood, often leading to devastating functional impairment. Medical treatment efficacy is often limited. Deep brain stimulation is an effective treatment of generalized dystonia, and the efficacy of pallidal stimulation is now well established.
Methods: We included Primary: DYT-1, Dystonia-plus: DYT-11, Herodegenerative dystonia (PKAN, Lesch Nyhan, and Mitochondrial) and secondary: Anoxic, trauma. The youngest patient was operated at 5 years of age. Stimulation electrodes are implanted under general anesthesia, without intra-operative electrophysiology or clinical testing, based only on stereotactic MRI and direct anatomical localization of the postero-ventro-basal GPi (motor). This technique allowed us to reduce the duration of the operation to 4 h, including general anesthesia, frame fixation, MRI acquisition, implantation of two electrodes under radioscopic control, immediate postoperative stereotactic MRI and frame removal. The advances in 3D-MR imaging permit the electrode implantation for deep brain stimulation without resorting to intraoperative localization techniques, which is especially helpful in children and for treating dystonia.
Results: We retrospectively analyzed the surgical procedure that has been designed and implemented in our center, using the Leksell G frame, for initiating deep brain stimulation and functional results in 106 dystonic patients, from November 1996 to April 2012.
Conclusions: GPi stimulation has proven to be an effective treatment for a lot of primary dystonic syndromes with particular efficacy in the disease due to the DYT1 mutation. Even in secondary dystonic syndromes results are very interesting and varying but effective.

0178

Risk of epileptic seizures after corticotomy

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Objective: Corticotomy is performed to reach subcortical lesions as tumors, vascular malformations, intraventricular masses. Such an approach is thought to be burdened by a certain risk of subsequent epilepsy. The aim of the present study is to assess the occurrence of post-corticotomy seizures in the experience of a single Institution.
Materials and Methods: Consecutive patients who underwent corticotomy for a supratentorial subcortical/deep lesion in the last 3 decades were considered (minimum 2-years follow-up). Children with preoperative seizures were excluded from the analysis as well as those who received postoperative antiepileptic prophylaxis and those lost at late follow-up. Also minor procedures, like shunt and third-ventriculostomy, were not considered. All children submitted to a non-corticotomic approach in the same period were included as controls.
Results: Overall, 196 patients were eligible for the study in the considered period (January 1980-January 2010): 109 children underwent corticotomy (group A) while 87 represented the controls (group B). Recurrent seizures occurred in 5 patients (4.5 %) of group A after a 40-days mean time interval from surgery. No significant correlations were found between occurrence of seizures and patients' age and sex, location of the corticotomy (in particular, temporal lobe versus other lobes), extent of the corticotomic approach, type of lesion. Three patients belonging to group B experienced recurrent seizures (3.5 %), meanly 2.4 months after surgery.
Conclusions: Although sporadic seizures may be frequent after neurosurgical procedures, recurrent seizures requiring antiepileptic drugs are relatively uncommon. Corticotomy does not seem to increase the risk of seizures significantly.

0068

Complications of Hemispherectomies

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Introduction: Hemispherectomies and functional hemispherectomies are effective operations for certain patients with intractable epilepsy. We reviewed a single institutional experience to understand their complications.
Methods: Hospital case records were surveyed for the period 2002-2012, and all hemispherectomies or functional hemispherectomies were selected. Case records were systematically reviewed and complications of the procedures tabulated.
Results: 59 patients underwent an initial operation, most by a single surgeon. Three patients had anatomic hemispherectomies, and the rest functional hemispherectomies with resection of a portion of the temporal lobe. All patients had the expected hemiplegia and homonymous hemianopia, with varying degrees of transient abulia. Of 51 patients with no pre-op shunt in place, 11 (22 %) required one postoperatively, several remotely. 3 patients had recurrent seizures due to residual tissue left connected, and had reoperation with resolution of seizures. Two patients undergoing anatomical hemispherectomy had severe bleeding requiring termination of the initial procedure, with completion at a second. 4 patients with functional hemispherectomies had postoperative swelling requiring aggressive management of intracranial pressure, one of whom died after withdrawal of care. A perioperative death resulted from withdrawal of care from an infant with hemimegalancephaly and a complex congenital syndrome, when catastrophic seizures arose from the contralateral hemisphere post-operatively. Two patients with extremely distorted anatomy developed endocrinopathy, including diabetes insipidus.
Conclusions: Bleeding is considerably less during functional hemispherectomy than during an anatomical. While functional hemispherectomy is generally safe, severe complications may occur. Strategies to avoid them will be extensively discussed.

0122

Seizure control after epilepsy surgery: experience in young children and adolescents

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Introduction: Surgery for intractable epilepsy is efficient for children suffering debilitating consequences of repetitive seizures. We analyze in this study seizure control and complications after epilepsy surgery in our center.
Methods: Data was reviewed retrospectively from 76 patients aged from 5 months to 17 years old who underwent epilepsy surgery at the Geneva and Lausanne University Hospital between 1997 and 2012. Epilepsy surgery included temporal surgery (30 cases), extra-temporal surgery (33 cases) and hemispherotomies (13 cases). Three aged groups were identified: under 3 years old (19 cases), between 4 and 12 years old (37 cases) and between 13 and 17 years old (20 cases). Mean follow-up was 27.25 months (range 4-96 months).
Results: Overall seizure-free rate at time of follow up was 67.1 %. Interestingly in children under 3 years old, 84.2 % were seizure free after surgery, compared to 61.4 % for the group over 3 years old *(t-test: p-value< 0.1)*. Post-operative antiepileptic medication was reduced in 62.2 % of patients. Outcome after temporal epilepsy was slightly better than extra temporal epilepsy with 76.6 % free of seizure compared to 60.6 % respectively. Reduction in post-operative anti-epileptic medication was observed in 70.5 % of patients under 3 years. Overall complication rate was 14.4 %.
Conclusions: This data highlights the significant seizure free rate of epilepsy surgery at a very young age under 3 y/o. Efforts to promote epilepsy surgery in children are crucial since it significantly improves there cognitive behavior. Better understanding of extra-temporal epilepsy is needed to improve seizure free rate in this group.

7. Oncology A – Oral Presentation

0093

Preoperative neuropsychological evaluation of children with thalamic tumors

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Introduction: Functional involvement of the thalamus in cognitive processing has been only anecdotally reported in the literature and mostly related to thalamic haemorrhages; there is no available information on cognitive development in children with thalamic tumors.
Clinical materials and methods: All the children admitted with a diagnosis of thalamic tumor at our Institution between January 2008 and January 2011 were considered for the present study. Exclusion criteria were : age under 18 months and the presence of severe neurological deficits, both preventing a reliable neuropsychological evaluation. A complete preoperative neuropsychological evaluation was performed.
Results: Twenty children were selected (mean age 102,4 months). Total IQ was in the normal range in all patients (mean: 90,1; SD: 13,87) with a significant difference between VIQ (mean 97,70 SD 17,77) and PIQ (84,82 SD 17.01). A significant correlation was found between global cognitive impairment and an histological finding of low grade tumors ($p=0.001$). Children with mesial thalamic tumor had higher working memory deficit and delayed recall disorders ($p=0.001$). Naming disorders were related to the presence of a bilateral ($p=0.0001$) or mesial thalamic tumor ($p=0.001$) without a significant difference between the involvement of the left or right hemisphere. A significant correlation was also found between the presence of neurolinguistic disorders and mesially located tumors ($p=0.001$). Children with right sided tumors had more frequently constructional praxia and executive function disorders ($p=0.0005$).
Conclusion: The present study suggests that differently located thalamic tumors might have specific neuropsychological profiles.

0189

Evaluation of a decision support system using multiparametric mri radiological data for phenotyping of paediatric posterior fossa tumours

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Background: Despite advanced multiparametric MRI studies, there remains significant uncertainty in radiological diagnosis of paediatric posterior fossa tumours. Histological diagnosis often guides surgical resection but is not always available intraoperatively. We have developed a radiological decision support system (DSS) that integrates

advanced quantitative imaging metrics to facilitate radiological phenotyping of these tumours to better guide surgeons.
Methods: Using the North West Children's Tumour Registry we collated available imaging, demographic and histological data on 130 paediatric patients presenting with a posterior fossa tumours from 1953 to April 2012. This data was used to generate a statistical framework underpinning a graphically driven DSS. 40 patients were randomly selected and their imaging re-reported using the DSS system, which was then compared to both the initial radiological diagnosis and subsequent histology.
Results: In 30 patients (77 %) the primary radiological diagnosis was concordant with proven histology. In the disconcordant cases 3 medulloblastomas were felt to more closely resemble pilocytic astrocytomas, three astrocytomas were felt to be cystic ependymomas/medulloblastomas, 2 medulloblastomas invading the foramen of Luschka were thought to be ependymomas and 1 brainstem ependymoma was thought to be a glioma. The DSS correctly predicted histology in more than 97 %.
Conclusions: Posterior fossa tumours have variable appearances with significant crossover between tissue types. This study demonstrates that a radiological DSS can facilitate the phenotyping of these tumours. Validation of the system requires prospective analysis of a larger number of patients and correlation to tumour histology.

0220

Cerebellar ataxia after posterior fossa tumor surgery and DTI tractography

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Introduction: Gait ataxia is a frequent cerebellar symptome following posterior fossa tumor removal in children and adolescents. We used diffusion tensor imaging (DTI) to investigate cerbellocortical white matter tracts being involved in postoperative cerebellar ataxia.
Methods: In 19patients after posterior fossa tumor removal (11.2± 4 yrs.; 10astrocytoma, 9medulloblastoma) cerebellar ataxia was evaluated by the International Cooperative Ataxia Rating Scale (ICARS). In all patients and additionally in 10healthy peers (12.9±3.8 yrs) a DTI MR data set was acquired using a 3Tesla scanner (General Electrics). By post-processing the image data sets using iPlan2.6 software (BrainLab) tractography was performed to identify cortico-pontine-cerbellar (CPC) and cerbello-thalamico-cortical (CTC) tracts as anatomical correlate for motor regulatory pathways between cerebellum and hemispheres. Volumetric measurements of the tracts were performed.
Results: In medulloblastoma patients the ICARS showed significant higher postoperative cerbellar ataxia (27.8±7) compared to astrocytoma patients (7.9±1.8). DTI tractography showed a significant diminished tract volume of CTC in medulloblastoma (12.8±1.4 cm3) and astrocytoma patients (15.1±1.6 cm3) versus controls (23.8±2.2 cm3). In contrast no differences were seen in CPC tracts. By correlating DTI with ICARS a significant negative relation of CTC tract volume versus ICARS was observed ($r2 = 0.39$; $p<0.001$).
Conclusions: ICARS could detect cerebellar ataxia in patients following posterior fossa tumor removal. A significant relation between ICARS and CTC shows the relevant anatomical substrate in efferent cerebello-cortical fiber tracts, which are passing the superior cerebellar peduncles.

0298

Paediatric cns tumours in the uk: 1-, 5- and 10-year survival

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Introduction: We report a population-based study examining long term survival for common paediatric CNS tumours in the UK. Results have been compared to the literature and to those recorded by the Surveillance Epidemiology and End Result (SEER) data set (covering 28 % of the US population). No such national study has previously been reported.
Methods: Data between 1996-2005 from the SEER registry and National Registry of Childhood Tumours (NRCT) was analysed. Microscopically confirmed first tumours coded as malignant neoplasms (by ICD 0-3), with any cause of death within 1-, 5- or 10-years of the diagnosis, were included. Literature was reviewed between 1995-2011. Kaplan-Meier estimation and Log-Rank Testing (Cox Proportional Hazard Regression Analysis) was used to calculate survival differences between tumour subtypes.
Results: Our study shows that overall survival (combining pilocytic astrocytoma, anaplastic astrocytoma, glioblastoma, PNET, medulloblastoma and ependymoma) at 1-, 5- and 10-years is significantly lower in the UK than in the US ($p<0.000$). For all tumour types analysed individually, there is a strong trend for better outcomes in the US - some of which are significant. Both UK and SEER outcomes are lower than those reported from trials.
Conclusion: Analysing data from large, well recognised and validated registries minimises bias associated with trial results and institutional studies. Reasons for the improved survival of the SEER patients might include: earlier diagnosis, rates of tumour resection, clinical trial inclusions, differing adjuvant therapy, and aggressiveness at relapse. Future studies need to look at morbidity and investigate the causes for the discrepancy in outcome.

0020

Investigation of the functional genes correlated with the prognosis of low grade astrocytomas

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Introduction: The reason why prognosis of low grade astrocytomas in children is significantly better than that in adult is still unclear. The aim of our study is to indentify the altered genes correlated with the prognosis of low grade astrocytomas.
Methods: Twenty fresh samples of low grade astrocytomas were collected and divided into two groups (adult /children group) and the altered genes of low grade astrocytomas in the both groups were revealed by microarray. The expression of the altered genes was further confirmed by immunohistochemistry (IHC) and quantitative real-time PCR (qRT-PCR) (5 children/5 adult fibrillar astrocytomas, 5 children/ 5 adult oligoastrocytomas).
Results: According to the profile of gene expression revealed by microarray, it was identified that the level of four genes (APOD,

OPCML, IL1RAP, TIMP4) significantly higher in low grade astrocytomas of children group than that of adult group. In addition, there were five genes (EZR, MMP7, MMP9, CXCR4, MST1) decreased in low grade astrocytomas of children group. Further investigation showed that the level of IL1RAP in children group was significantly higher than adult group detected by qRT-PCR and immunohistochemistry (IHC) ($p<0.05$).
Conclusions: The profiles of gene expression in low grade astrocytomas from the different age patients had been revealed. The altered genes we identified may be associated with the prognosis of low grade astrocytomas. The biological function of the altered genes should be investigated. Identification of the correlation between the altered genes and the prognosis of the low grade astrocytoma will improve the clinical diagnosis and treatment.

0024

Predicting the clinical behavior of pilocytic astrocytomas in children: the utility of magnetic resonance spectroscopy

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Introduction: Despite the generally favorable prognosis for children with pilocytic astrocytomas, outcomes are not always predictable. This study aims to establish the predictive value of magnetic resonance spectroscopy (MRS) in the clinical course of juvenile pilocytic astrocytomas (JPA; WHO grade I)
Methods: Medical records form 40 patients (22 females) with histologically diagnosed JPA (Supratentorial 11, Infratentorial 29) and pre-treatment MRS scans were retrospectively analysed under an IRB approved protocol. All spectra were acquired using single voxel, short-echo point-resolved spectroscopy.
Results: Forty patients underwent surgical resection of tumor; 9 patients required multiple resections. Median age at diagnosis was 5 years (range: 1 month to 16 years). Five patients recieved pre-resection chemotherapy. One patient recieved radiotherapy. Ten patients recieved post-resection chemotherapy. No other patient received radiotherapy. All patients were followed for atleast 6 months postoperatively. Patients were characterized by outcome: (1) Progressive or Recurrent disease at most recent follow-up or Deceased; (n=5) and (2) Stable disease (stable residual tumor or no evdence of disease); (n=35). MRS data were analysed for absolute concentration and concentration relative to creatinine (Cr). The following six metabolites were found to be significantly higher in patients with progressive disease compared to those with non-progressive disease: (Glutamine + Glutamate)/Cr, Lactate/Cr, N-Acetyl Aspartate/Cr, Cholin/Cr, Citrate/Creatinine and Myoinositol/Cr.
Conclusion: Progressive JPAs may have a istinct metabolic profile when compared with stable residual tumor. This discernable property may allow better prognostication of JPAs and aid in planning postoperative management.

0030

Down-regulation of miR-92b can induce cell apoptosis in pilocytic astrocytoma by targeting the inhibitory protein DKK3 and blocking the Wnt/β-catenin signaling pathway

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Background: MicroRNAs (miRNAs) are noncoding RNAs inhibiting the expression of numerous target genes by post-transcriptional regulation. MicroRNA-92b expression is elevated in glioma and its cell lines(U251,U87); an inhibitor of miR-92b can induce cell apoptosis in glioma. Pilocytic astrocytoma is one of the most common forms of glioma presenting in pediatric patients. This study investigates the pathway used by miRNA-92b to induce cell apoptosis in this form of tumor.
Methods and materials: microRNA expression profiling, bioinformatic analysis, luciferase reporter assays, genetic knockdown and biochemical assays were used to characterize the regulation pathways of miR-92b in pilocytic astrocytoma.
Results: The authors identify the DKK3 gene as a target of miRNA-92b. Furthermore, knockdown of miR-92b by antisense oligonucleotides was found to upregulate DKK3 expression. Upregulated DKK3 expression suppressed the Wnt signal pathway and induced apoptosis of glioma cells.
Conclusions: miRNA-92b induces glioma tumorigenesis. Inhibition of miRNA-92b can induce cell apoptosis by upregulating the inhibitor DKK3, thereby blocking the Wnt signaling pathway. Therefore, inhibitors of miR-92b should be explored as novel targets for glioma therapy.

0066

Malignant optic pathway glioma in children

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Background: To report a rare malignant presentation on the optic pathway glioma (OPG) in six children. The clinical course, treatment strategies, morbidity, and mortality were demonstrated in this series
Patients and methods: A series of six patients with malignant OPGs retrospectively followed by 30-years. Most patients had rapidly progressing visual loss along with visual field defect. The average age was 7.3 years old. The tumors were involving optic nerve in 4, optic chiasma in 4, optic tract in 4, and hypothalamus in 2. There were 3 patients of obstructive hydrocephalus and had VP shunt surgery for CSF diversion. Tumor resection was performed in all cases and all the specimen was sent to further analysis.
Results: Anaplastic features (WHO Grade III) were found in 5 cases, and one specimen was defined as glioblastoma (WHO Grade IV). Five patients received adjuvant radiotherapy and chemotherapy. Most of the patients could be controlled in a short period of time and local recurrence or diffuse leptomeningeal seeding happened later with visual deterioration and disturbance of consciousness. Three patients died in 2, 6, and 7 years after diagnosis.
Discussion: The outcome of malignant OPGs was usually fatal in reported cases. New treatment paradigm with concomitant temazolamide (TMZ) and radiotherapy (RT) with adjuvant TMZ for high grade glioma may also help the treatment of malignant OPGs in children. The treatment outcome of these patients may reflect the better effect of TMZ + RT on malignant glioma with methylated MGMT promoter.

0077

The molecular analysis of atypical teratoid / rhabdoid tumor

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Background: Atypical teratoid / rhabdoid tumor (AT/RT) is a highly malignant central nervous system neoplasm in early childhood. However, the molecular characters of this tumor are still unknown. In this report, we performed the molecular analysis of this tumor using high throughput array system from original specimens and primary culture cells.
Methods: We have succeeded to culture AT/RT and medulloblastoma tumor cells in widely utilized condition. Then, we extracted the DNA from paraffin embedded tumors and cultured cells. Using these DNAs, we performed high throughput study and compared the expression data of these tumors with a commercially utilized SNP array system.
Results: We identified several differences in the regulations of genes between AT/RT and medulloblastoma. Interestingly, our study showed pathognomonic expression data in the conditions of culture mediums.
Conclusions: Our comparison may reveal the molecular characteristics of AT/RT. The analysis of the primary cultured cell in different conditions would provide an effective way to study the biology of AT/RT and to identify potential targets for future therapeutics for this tumor.

0114

A single centre study of 860 cases of craniopharyngiomas over 5 decades : Radical or Conservative surgical management

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Background: Controversity persists in extent of resection in these benign but challenging tumors. We performed retrospective analysis of craniopharyngiomas operated at our hospital between 1965 -2010 to determine changing practice of management of these tumors over last 5 decades.
Methodology and Observations: 860 cases of histopathologically proven craniopharyngiomas [405 children (<18 yrs)/455 adults , 537 males / 323 females), tumors >4 cm in 42.5 % cases]. Radical/total excision in 179 cases[(perioperative mortality (25/179,14 %), postoperative DI 74.5 %]. Subtotal excision in 577 cases(67 %), perioperative mortality 6.3 %, postoperative DI 34.7 %)]. Recurrence noted in 83/497(16.7 %) patients(> 6 mo-5 yr follow up). Adamantinous pattern noted in 437/506((86.4 %) cases while papillary tumors noted in 47/506 cases. Perioperative mortality was noted in 63/860 cases (7.3 %). Brain invasion noted in 82/437(18.7 %) cases of adamantinous tumors (pediatric adamantinous tumors had significantly more brain invasion than adult counterparts). Recurrence free survival in total excision (13.5 %) vs Subtotal excision group (20 %) [p>0.05] noted. Recurrence free survival in RT with STE was not better than in STE alone (p value 0.85).
Conclusions : There is a shift from subtotal excision (1965-1980s) to gross total tumor excisions (1980-2002) and again to subtotal tumor excisions . High perioperative mortality, high incidence of diabetes insipidus in total excision group and less benefit of postoperative radiotherapy was noted in present series. Subtotal excision group outcome compared favourably with total excision group in long term follow up.

0120

Cerebellar pilocytic, intermediate pilomyxoid and pilomyxoid astrocytomas: a study of operative findings, imaging features and clinical course

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Background: Pilomyxoid astrocytoma (PMA) and Intermediate Pilomyxoid Astrocytoma (IPA); recently described entities of glioma; were reported in small case series to differ from Pilocytic Astrocytoma (PA).
Objective: This Study describes the operative findings, imaging features and clinical course of cerebellar IPA and PMA compared to PA.
Methods: Patients diagnosed with Cerebellar PA, IPA and PMA between July 2007 and December 2011 were included. Pre operative MRI Brain and Spine, Post operative and follow up imaging studies were performed. Operative, imaging and clinical data were abstracted and analyzed using IBM SPSS V.17. Fisher's Exact Test was used to determine the significance of correlation between different categorical groups.
Results: 59 patients; 45 PA, 8 IPA, and 6 PMA with median age of 7, 5 and 8.5 years respectively were included. Cysts observed in 36 cases; 24 PA, 6 IPA and all PMA cases. Brain stem (BS) compression noted in 26 cases; 13 PA, 7 IPA, and all PMA cases. Heterogenous contrast enhancement (CE) detected in 34 cases; 20 PA and all IPA and PMA cases. Recurrence occured in 6 cases; 4 PA and 2 PMA. A significant correlation existed between histopathology and CE (p=0.037), between pathology and cyst formation (p=0.025) and between pathology and BS compression (p=0.03). PMA and IPA had higher incidence of BS invasion and Leptomeningeal Dissemination compared to PA. PA cases showed better surgical outcome, event free and overall survival.
Conclusion: Cerebellar PMA and IPA are more aggressive compared to PA. Further study with inclusion of more cases is needed.

0156

Osteopontin as a new potential biomarker for AT/RT and other CNS emryonal tumors

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Background: Atypical Teratoid/Rhabdoid Tumor (AT/RT) is one of common CNS embryonic tumors. Its outcome remains very poor due to difficulty in differential diagnosis. OPN is an oncoprotein crucial for tumor relapse/metastasis. However, its expression and function in CNS embryonic tumors remain elusive.
Objective: To study the correlation of OPN expression with prognosis of CNS embryonic tumors. To investigate whether OPN could be a new biomarker for differential diagnosis between AT/RT, MB and PTEN. To explore the role of OPN in oncogenesis of CNS embryonic tumors.
Methods: A retrospective study was conducted on history, pathology results and follow-ups of patients with CNS embryonic tumors at our center from 2006.1 to 2012.1. IHC is introduced for OPN tests in all paraffin-embedded pathology samples of CNS embryonic tumors. Difference will be analysised by statistics.
Results: OPN IHC staining is 100 % positive in AT/RT, 37.5 % in MB, and 35.7 % in PNET. The differences of OPN positive rate and staining grading among these three tumors is statistical significant. The risk of relapse/metastasis is 1.6 times higher in CNS embryonal tumors patients with strong or mid positive OPN staining than negative. OPN stainings reveal highly vascular characteristic in strong positive staining area and elevated OPN expression in samples with recurrence/metastasis.
Conclusion: OPN will be a valuable biomarker for differential diagnosis between AT/RT and MB/PNET, moreover, to be a prognostic marker for recurrence/metastasis in CNS emryonal

tumor. OPN may be involved in invasion and angiogenesis of CNS emryonal tumor.

0199

Single nucleotide polymorphisms (SNPs) of the vascular endothelial growth factor (VEGF) gene and their association with the development and survival of paediatric brain tumours

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Background: VEGF SNPs are associated with the development and outcomes of a variety of cancers.
Aim: We examined the association and outcome with the -460 and +405 VEGF SNPs and Children's brain tumours.
Method: This study utilised the Ontario molecular-epidemiological, case-control database of childhood brain tumours. Children with brain tumours were recruited along with age and gender matched healthy controls. SNP genotyping was undertaken using TaqMan assays.
Results: There were 193 cases representing the spectrum of paediatric brain tumours with 474 controls. For patients with low grade astrocytomas there was an increased frequency of the CT genotype and a decrease in the homozygous CC genotype at the -460 locus compared to controls. For all grades of astrocytoma there was a significant increase in the overall C allele frequency.
For low grade astrocytomas there was a non-significant progression free survival advantage for patients with the VEGF -460 CC genotype with no recurrence of tumours in these patients. At the VEGF +405 locus there was a non-significant worsening of progression free survival for patients with the CC genotype. At the VEGF -460 locus for the group of medulloblastomas and ependymomas the CC genotype patients showed 100 % overall survival. At the VEGF +405 locus the CC genotype showed a non-significant overall survival advantage with 100 % survival in this group. The TG haplotype of VEGF -460/+405 showed a trend to worse overall survival compared to patients with non-TG haplotypes.
Conclusion: VEGF SNPs have associations with and appear to influence outcome in Children's brain tumours.

8. Oncology B – Oral Presentation

0103

Use of intraoperative mri for prdiatrics posterior fossa tumors: national neuroscience institute experience

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Objective: This study describes the experience of pediatrics posterior fossa lesions with the use of iMRI and analyzes its impact on surgical resection of intracranial lesions, including safety and efficacy.

Methods: A retrospective review of the database was constructed from January 2006 to December 2011 for all pediatric posterior fossa lesions that were operated at the National Neuroscience Institute in King Fahad Medical City. The following variables in both groups : blood loss, extend of resection, length of hospital stay and complications were all analyzed by SPSS software through Chi-Square and Mann-Whitney U tests.
Results: The authors found that 78 cases were performed. iMRI resections were performed in 48 cases whereas 30 conventional resections had been performed without the iMRI. The mean patient age was 6.2 years (range 1 year -18 years) in the iMRI group and 8.3 years (range 11 months -18 years). The estimated blood loss mean was 289 ml in iMRI cases and 273 ml in the other group (P=0.452). Gross total resection was achieved in 33 cases in the iMRI cases Vs 13 cases in the other group and this trended toward significance (P=0.35). Lenth of hospital stay mean in iMRI cases was 30.3 days and the other cases was 27.5 days (P=0.754). Post operative complications were present in 20 patients of iMRI Vs 17 patients in the other group (p=0.22).
Conclusion: Intraoperative MR imaging-guided resections resulted in significant changes in comparasion to the conventional pediatric neurosurgical resections for posterior fossa tumors.while potentially reducing the per-case cost by diminishing the need for early reoperation.

0111

KIAA1549-BRAF fusion transcripts in pediatric low grade glioma and its association with clinical manifestation in china patients

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Introduction: Alterations of BRAF are the most common known genetic aberrations in pediatric gliomas. Duplications of KIAA1549-BRAF create fusion proteins with constitutive B-Raf kinase activity. The development of BRAF inhibitors as drugs has created an urgent need for robust clinical assays to identify activating lesions in BRAF.-while the KIAA1549-BRAF duplication has not been reported in a large number cases from China.
Methods: The methods for KIAA1549-BRAF fusion transcripts was used according to our previous paper (The Journal of Molecular Diagnostics,2011,13(6):669-677) to test 98 consecutive pediatric gliomas in Beijing TiantanTan hospital. These patients have been regular followed up. The association between KIAA1549-BRAF and their clinical manifestation are analyzed.
Results: Mean age of the 98 consecutive patients at presentation was 7.6 years (range 10 months-28 years). Average period of follow-up was 31 months (range 3 ms-8 yrs). 76 cases were pediatric low gliomas, 18 cases were medulloblastoma, 4 cases were ependymas. Among which, 53 cases were optic pathway gliomas. All tumors were partial resected (50 %-70 %) and pathology showed fibrillary astrocytes in 27 cases (51 %), pilocytic astrocytomas in 24 cases (45 %). The mean progression-free survival was 26 months (range 3 ms-64 ms). The KIAA1549-BRAF positive rate in pediatric gliomas was 75 %. There were only 2 cases of NF1 in the OPG patients.
Conclusions there was but not significant association between KIAA1549-BRAF fusion and prognosis from our follow up. These results may be useful for incorporation into future studies of pediatric gliomas in BRAF inhibitors clinical trials.

0204

Combined targeting of the mTOR pathway in medulloblastoma

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Recent studies have implicated sonic hedgehog (SHH) and insulin growth factor (IGF) as important mediators leading to activation of the serine/threonine kinase, mammalian target of rapamycin (mTOR). mTOR, consisting of two catalytic subunits mTORC1 and mTORC2, serves as a convergence point for many growth stimuli controlling cellular processes that contribute to the initiation and maintenance of tumors. Here we elucidate the role of the mTOR pathway, in the development and maintenance of medulloblastoma, and assess the use of mTOR inhibitors as novel therapeutic agents.

Medulloblastoma cells treated with mTORC1 inhibitor, rapamycin, suppressed the phosphorylation of mTORC1 substrate p70S6K at thr389, and pretreatment with rapamycin abrogated growth factor-induced activation of S6K. Rapamycin also suppressed the growth factor-induced activation of mTORC2 substrate $pAKT^{Ser473}$. Expression of cyclic dependent kinase inhibitor, P27, decreased following PDGF and increased following rapamycin treatment, suggesting their respective impact on cell proliferation via cell cycle control. Suppression of mTOR lead to suppression of expression of oncogene Myc. PP242, a novel combined mTORC1/2 inhibitor, and rapamycin limited the proliferative effect by reducing the S-Phase entry as assessed by EdU incorporation, while PDGF increased EdU incorporation. PP242 reduced the number of cells entering the S-phase to a greater extent than did rapamycin. Migration of medulloblastoma cells towards fibronectin was suppressed in a time-dependent manner after rapamycin treatment.

These results indicate that the mTOR pathway is involved in the pathogenesis of medulloblastoma, and that combined targeting of this pathway may provide a strategy for therapy of medulloblastoma.

0245

Therapeutic strategy on the intracranial immature teratoma in children (38 cases report)

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Objective: A preliminary therapeutic strategy on the immature teratoma in children was set-up according to the clinical features.

Methods: It was an analysis on 38 cases of immature teratoma including 26 males and 12 females, age ranged from 2.5 to 15 years old, and the location including 27 cases at pineal region,8 cases at sellar region and 3 cases at basilar ganglion region, from Jan.2002 to Dec.2010. There were 26 cases which diameter of tumors were larger than 3 cm and serum exam confirmed slightly elevated in AFP and β-HCG and they were divided into two groups. Group A (10 cases), that is, the patients were under operation firstly and chemo- or radiotherapy was followed. Group B (16 cases, recently), the patients were treated by two courses chemotherapy and when the tumor showed significant shrink, the operation were followed. All the diagnosis were confirmed by the histopathology and mean follow-up were 45.5 months.

Results: There were 4 patients deceased in Group A and 3 patients deceased in Group B. Compared with the Group A, the survival time and quality of life according to KPS scales in group B were much better.

Discussion: The growing type of infiltration and invasiveness in the immature teratomas directly impact on the operative result and prognosis. For some giant tumors combing AFP or β-HCG slightly increased, chemo- or radiotherapy firstly were recommended, which could shrink the volume of tumor and more important could form a tumor's pseudomembrane which could significantly reduce the operative injury.

0266

Role of surgey in treatment of immature teratoma

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Introduction: To evaluate whether a multimodal approach including craniospinal irradiation (CSI) improves treatment outcome in immature teratoma patients.

Methods and materials: We reviewed the records of 32 patients with NGGCTs. Fourteen patients belonged to the intermediate prognosis group (immature teratoma, teratoma with malignant transformation, and mixed tumors mainly composed of germinoma or teratoma), and 18 patients belonged to the poor prognosis group (other highly malignant tumors). Nineteen patients were treated with a combination of surgery, chemotherapy, and radiotherapy (RT); 9 patients received chemotherapy plus RT; 3 patients received surgery plus RT; and 1 patient received RT alone. Twenty-seven patients received CSI with a median of 36 Gy (range, 20-41 Gy) plus focal boost of 18-30.6 Gy, and 5 patients received whole-brain RT (WBRT) (20-36 Gy) or focal RT (50.4-54 Gy). The rate of total and subtotal resection was 71.9 %. The median follow-up for surviving patients was 121 months.

Results: Treatment failed in 7 patients. Three of the 5 patients who received focal RT or WBRT had local failure. Four cerebrospinal fluid (CSF) failures occurred after CSI. No failure occurred in the intermediate prognosis group. Ten-year recurrence-free survival (RFS) and overall survival (OS) for all patients were 77.6 % and 74.6 %, respectively. OS for the two groups were 85.1 % and 66.7 %, respectively ($p=0.215$). Tumor histology and CSI were significant prognostic factors for RFS, and CSI was significantly associated with OS.

Conclusions: Surgical resection is important for treatment outcome. CSI should be considered for patients with poor prognostic histology.

0287

The cerebellomedullary fissure approach is a better method for the patients with tumor in the fourth ventricle zone or at the back of pons

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Objective: The purpose of this study is to select better and safer approach to resect tumor in the fourth ventricle zone or at the back of pons comparing the complication of surgery via cerebellomedullary fissure (CMF) approach with splitting inferior vermis approach.

Methods: Splitting the inferior vermis approach and CMF approach were adopted in 20 patients and 54 patients, respectively. All patients had been cured and followed up after operation.

Results: Among the 20 cases with splitting the inferior vermis, total resection was achieved in 11,subtotal resection in 6, major resection in 1and partial resection in 2. Five cases of these 20 presented cerebellar mutism, 3 cases presented ataxia, but no death case or case with injury of posterior cranial nerves. Among the 54 cases with CMF approach,

total resection was achieved in 48, subtotal resection in 2, major resection in 2 and partial resection in 2, None of these 54 cases present approach-related complications such as cerebellar mutism, ataxia or injury of posterior cranial nerves, No death case.
Conclusion: CMF is a safer approach that can provide a panoramic view from the obex to the aqueduct without splitting the inferior vermis to reduce the complications.

0031

Brain tumors in children under 3 years old- a retrospective study

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Objective: To analyze the primary brain tumors in children under 3 years old in a single Chinese institute.
Methods: Patients under 3 years old with primary brain tumors and surgically treated in our institute were selected in the period from January 2006 to December 2010 . We retrospectively assessed the age, sex, clinical presentation, tumor location, pathology, operation and outcomes.
Result: There were 87 patients in our group, inclusing 57 males and 30 females. Supratentorial tumors were more common than infrantentorial tumors and mostly presented in midline . Histologically, neuroepithelial tumors predominated: low-grade astrocytic tumors (20.7 %), medulloblastoma (13.8),ependymoma tumors (12.6 %) and choronoid tumors (12.6 %) were common tumors in this study. Macrocephaly (48.3 %), vomiting(36.8 %), focal motor weakness (19.5 %) and seizures(16.1 %)were prominent symptoms. The prognosis is related to the tumor location, pathology,postoperative chemotherapy and surgical removal.
Conclusion: The prognosis of brain tumors in the patients under 3 years old is poorer than the older children. Surgical treatment is the first option.The strengthen of perioperative period treatment and postoperative adjuvant therapy will be the focus for our future research work.

0045

The role of radical surgery in the management of children with intracranial ependymoma

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Introduction: We analyzed the role of radical surgery in the management of intracranial ependymoma in children and adults.
Methods: Thirty-four patients [15 children (age range, 0-14 years; median, 4 years) and 19 adults (age range, 18-68 years; median, 44 years)] with intracranial ependymomas were enrolled. Seven children and 14 adults had supratentorial tumors and the remaining patients had infratentorial lesions. We retrospectively evaluated histological grade, extent of resection, effect of radiotherapy, and outcome [5-year overall survival (5 y-OS) and 5-year progression-free survival (5 y-PFS)].
Results: Significant prognostic factors were extent of removal (5 y-OS, 78.3 % in GTR vs 49.9 % in non-GTR), histological grade (5 y-OS, 79.4 % in grade II vs 56.6 % in grade III), and supratentorial location (5 y-PFS, 50.9 % in supratentorial vs 36.9 % in infratentorial). The 5 y-PFS of GTR/subtotal removal (STR) plus radiation was significantly greater than that of GTR/STR alone (58.4 % vs 20.0 %). Comparison between childhood and adult ependymomas showed no differences in tumor location, histological grade, extent of removal, and outcome. The 5 y-PFS of GTR/STR plus radiation and GTR/STR alone in children were 66.7 % and 25.0 %, respectively. Long-term remissions were achieved in 5 children with supratentorial tumors who underwent radical resection (lobectomy or GTR with surrounding white matter resection) and 1 child with infratentorial tumor who underwent GTR plus radiation. Remission was not achieved in patients treated with non-GTR plus adjuvant therapy.
Conclusion: Clinical profiles of children and adults with ependymomas are not different. Radical resection should be the intent of surgery. However, postoperative radiotherapy is recommended when radical resection is impossible.

0089

Cerebral tumors manifested in the first year of age and their treatment

Status: AcceptedPresentation type: Other
Category: 8. Oncology

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Background: Tumors of the brain manifested in young pediatric patients require specific diagnostic and therapeutic approaches in the first months after birth. The authors present a group of pediatric patients treated for cerebral tumor in the first year of age in Brno Faculty Hospital within last 10 years.
Methods: 19 pediatric patiens (8 girls, 11 boys) were included. Median age at tumor diagnosis was 6.1 months (including one prenatal diagnosis and two on the day of birth). Neuroimaging methods, clinical course, neurosurgery and oncology treatment of various histological tumor types and clinical outcome were evaluated.
Results: Low grade (36.8 %), high grade (47.4 %) and histologically non-classified tumors (15.8 %) were diagnosed. 3 patients (15.9 %) died without treatment shortly after birth. 13 patients (68.4 %) underwent neurosurgical treatment, median age at surgery was 8.3 months. Oncological treatment followed in 10 patients. 1 patient (5.3 %) underwent chemotherapy only. 2 patiens (10.5 %) were treated by "wait and see". Total remission in 16 treated patients was achieved in 8 cases (50.0 %), 3 patients (18.8 %) died. Overall mortality was 31.6 %.
Conclusion: High mortality and morbidity rate was found. This may be related to the immaturity of the central nervous system tissue and a high incidence of histologically undifferentiated tumors. To improve the treatment results, more accurate prenatal diagnosis, total neurosurgical resection and reduced oncological therapy morbidity should be achieved. Effective psychomotor development stimulation, motivation and cooperation of the patient's family and even multidisciplinary

collaboration of medical experts is necessary to improve therapeutic outcomes.

0154

Paediatric glioblastoma: clinicoradiological profile and outcome

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Introduction: Glioblastomas are extremely uncommon in paediatric population. Due to lack of sufficient literature it is difficult to deduce a consistent clinical and radiological profile and more so the outcome in these cases. However, on review of literature it is apparent that these are different from adult population.
Material and Methods: 65 children(= <18 years) in the previous 15 years with histopathological diagnosis of glioblastoma were included in the study. Essential clinical data, radiological profile and surgical procedure performed(gross total resection, sub-total resection or biopsy) were analysed. Adjuvant treatment received (radiotherapy+/- chemotherapy) was also noted. Progression-free survival(PFS) and overall survival(OS) was calculated and factors affecting them were analysed.
Results: Male to female ratio was 3:1, mean age was 13.29+/-4.56.Most common symptoms were of raised intracranial pressure and seizures. Most common location was lobar with frontal lobe being the most common site. All cases had perilesional edema and 98.5 % of cases had contrast enhancement. Two-third cases underwent gross total resection and 1 case underwent stereotactic biopsy and remaining underwent sub-total resection. The median overall survival was 35 months with 5 year OS being 26 %. PFS was 14 months with 2 year PFS being 27 %. Extent of resection was the most important factor in determining the OS and PFS.
Conclusions: Most commonly these lesions present with features of raised ICP and seizures. OS is nearly 3 years with 5 year survival of 26 %. OS and PFS is affected by extent of resection.

0180

Brainstem gangliogliomas in children. our experience concerning six cases operated

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From a series of 82 pediatric patients, we report our experience with 6 patients operated for a brainstem ganglioglioma.
Material and Methods: Six children, 4 boys and 2 girls, were operated between 1996 and 2010. The age range between 4 to 7 years old. For 4 children the symptomatology was characterized by an intracranial hypertension syndrome and cerebellar signs. For one child the diagnosis was made after a head injury for persistent headaches and one patient presented a torticollis. All patients were studied with a craniospinal MRI. A patient needed a third endoscopic ventriculostomy before the direct approach. All patients were operated in sitting position and the surgical removal was considered large but incomplete out one case in which a simple biopsy was realized at level of the bulbo medullary junction. Two patients were reoperated for a more important tumoral resection. One patient presented a local recurrence with a panmedullary extension. Three patients were treated with chemotherapy and three patients are normally followed.
Results: Only one patient died for a local progression at level of the bulbo-medullary junction. The other five patients are still alive: three with a normal life, one with a psychiatric follow-up and one with severe motor deficits.
Conclusion: Brainstem gangliogliomas are rare lesions with unpredictable behavior even in absence of histological signs of malignancy. Their complete removal is, in our opinion, the best treatment to avoid a complementary treatment with chemotherapy and radiotherapy. The total removal is rarely possible for their location and consequently to avoid severe sequels

0197

Outcomes for supratentorial primitive neuroectodermal tumours (SPNET) diagnosed in the north west region of the UK during 1954-2008

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Background: Historically, SPNETs account for 2.5 % of childhood CNS tumours and have a poor prognosis.
Aim: This project aims to identify factors and trends in survival among children with SPNETs in the North-west region between 1954-2008.
Method: Patients who had been diagnosed with SPNETs in the North West Region between years 1954-2008 were extracted from the database in the North West Children's Tumour Registry. Data relating to presentation, management and survival for these patients were analysed.
Results: There were 18 male and 12 female SPNET patients identified (2.1 % of the registry total). Median age at diagnosis was 4 years 11 months. By univariate analysis, both chemotherapy ($p=0.008$) and radiotherapy ($p=0.004$) improved survival. Median survival improved with time from 6 months to 8 years 4 months between the first and second halves of the cohort ($p<0.001$). Children under 3 years at diagnosis had a trend towards worse survival ($p=0.083$). Extent of surgical resection had no influence on survival ($p=0.53$). In multivariable analysis treatment in the second half of the cohort had the strongest influence on survival (Cox $p=0.02$, $RR=6.97$)
Conclusion: Survival for children with SPNET has significantly improved in the modern era. The reasons for this appear to be multifactorial.

0208

Long-term outcome in patients with intracranial germinoma

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Introduction: The purposes of this study were to assess the long-term outcomes in patients with intracranial germinoma.

Methods: We retrospectively analyzed 46 patients with newly diagnosed intracranial germinoma between 1990 and 2009 at University of Niigata. Thirty-eight (83 %) patients underwent radiotherapy alone: 32 craniospinal and 6 whole-brain irradiation. Seven (15 %) received radiochemotherapy, and 1 (2 %) had chemotherapy alone. Median doses for the whole brain, spine, and primary tumor site were 26.9 Gy, 26.6 Gy, and 49.8 Gy, respectively. The median follow-up period was 125 months.
Results: The 10-year overall and relapse free survival rates were 93.3 and 89.3 %, respectively. None of the 38 patients with sole radiotherapy developed recurrences, while 1 of 7 those with radiochemotherapy and 1 patient with chemotherapy developed recurrences. Four patients died, who had no recurrence until their death. Eight patients had low Karnofsky performance scale (KPS) score right after initial treatments, which associated with impairment of neurocognitive functions, severe surgical complications, and neurological impairments ($p<0.05$). Four child-onset patients had late declines in KPS score, which associated with late declines of neurocognitive function ($p<0.01$).
Conclusions: Radiotherapy-only approach is a curative treatment for germinomas. The treatment toxicity about radiotherapy appears to be less than anticipated. Brain damage by caused tumors and surgical complications were considered to aggravate functional outcomes. However, some child-onset patients suffered neurocognitive dysfunction after treatments, which are attributable to late adverse effects of radiotherapy. Hence, treatments for intracranial germinoma should be selected according to ages and extent of the tumor.

0291

pinealoblastoma: analysis and results in 19 patients

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The authors evaluate their results when treating pediatric patients with pinealoblastoma using surgery, radioterapy and chemotherapy in a serie of 19 patientes.
This is a retrospective clinical evaluation of 92 patients with primary tumors of the pineal region treated from 1991 through 2012 wich 19 was pinealoblastoma.
Their median age was 7,6 years (range 5 m - 14 years). Most of then received sequential systemic chemotherapy and adjuvant conventional radiation therapy besides surgery. Eight(42 %) of 19 patients are alive, two are under three years and six are older than three years. Eleven patients died
This initial experience suggests that surgery with chemotherapy and radiation therapy are a valuable treatment modality for the management of pinealoblastoma.

0293

The risk of bleeding during craniotomy for tumor in children with previous radiation

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Introduction: Craniotomy for tumor in children with a history of prior radiation therapy is thought to be associated with an increased risk of bleeding. We have reviewed a large pediatric patient population to evaluate the risk of previous radiation therapy on craniotomy for tumor.
Methods: We analyzed 493 patients undergoing 609 craniotomies for tumor, both for resection and for biopsy, from 2000 through 2011. Transsphenoidal surgeries and stereotactic biopsy through burr holes were not included, although transcranial endoscopic procedures were. There were 495 craniotomies in children with no previous radiation therapy. The target group was 19 patients undergoing 24 craniotomies who had undergone previous radiation therapy and no other adjuvant therapy. The age range of these patients was 3 - 23 years. There were 11 males and 8 females. The intra-operative blood loss was identified for all procedures except one.
Results: The average blood loss for 495 craniotomies in children with no previous radiation was 164.3 cc. The average blood loss for children having had previous cranial radiation was 203.5 cc. This represents a 19 % difference from the non-radiated population.
Conclusion: There appears to be a higher risk for intra-operative bleeding during craniotomy for tumor in children with previous radiation therapy. The extent of surgery, tumor type and location, and surgeon were not yet analyzed but are likely important factors in this analysis. This information may be important in the preoperative planning and family consultation as well as in the intra- and immediate post-operative expectations of craniotomy.

9. Spine – Oral Presentation

0026

Multimodalitiea of surgical treatment in pediatric and adolescent lumbar disc herniation

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Intervertebral disc herniation is a relatively rare diseaes entity in children as compared with adult with roughly 5 % lumbar disc disease occurring in patients younger than 18 years age.
The aim of this study was to assess the radiological, clinical and effects multiple surgical modalities and case outcomes for adolescents with lumbar disc horniation, and compare with adult case. The case of 32 adolescents (6 girls and 26 boys, mean age : 12~18 years) who were surgically treated for lumbar disc herniation in our clinic between 2005 and 2011 were retrospectively reviewed.
The mean follows up time was 3 years. The collective histories revealed that 25(80 %) of the 32cases involved trauma or intense sports activities. Low back pain was the most common preoperative complaint(20 cases 62.5 %)and radiating pain associated with back pain was 16 cases(50 %). None of the 32 patients had major symptoms during follow-up preoperatively and most patients were engaged in normal activities during this period. The main features of lumbar disc herniation in adolescents are different from those seen in adults.
Careful assessment for surgical modalities such as follows laminectomy(14cases), endoscopic(9 cases), chemonucleoiysis(3 cases), RACZ(4 cases) and total disc replacement(2 cases) was evaluated.
Each individuals were evaluated the surgical outcomes in each surgical modality.
Results of surgical management in adolescents lumbar disc herniation were satisfactory and no recurrence.

0259

Complications of instrumentation in the cervical spine and craniovertebral junction in paediatric patients- an analysis of 141 cases

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Aim of the study: To highlight complications caused during instrumentation in surgery of the cervical spine including the craniocervical junction in the paediatric age group by analyzing retrospective data of the last 8 years.
Material and Methods: The data of 141 patients in the age group 0-16 years operated by a single surgeon at the Park Clinic Kolkata over a 8 year period from 2003 to 2010 were reviewed to assess complications .The indications of surgery had varied from congenital atlantoaxial junction anomalies(64) to tuberculosis(36) and tumours(23) as well as cervical spinal injuries(18). The complications were grouped as follows: a)Those due to faulty diagnosis. b)Those due to faulty surgical techniques c)Those due to failure of instrumentation and d)Other complications.
Results: 2 patients were identified as having "inappropriate diagnosis" labelled on them,including one with an unclassifiable craniovertebral anomaly, 4 patients had problems with "inappropriate surgical techniques"including one with a massive pseudomeningocele due to anterior cervical approach for a recurrent enterogenous cyst, 7 patients had problems due to growing spine and inappropriate stabilization techniques,including one with displaced screws and pullout of fixation device, and 2 had other complications including one with orthosis induced skin abscess.Of the patients, only 5 had neurological deterioration after surgery.
Conclusions: Complications after instrumentation at the cervical spine and cervicocranial junction surgery is not as uncommen as one would imagine and has occurred in over 10 % of paediatric patients operated on by a single surgeon in this series. This is an attempt to analyse the causes and suggest means of preventing similar problems in future.

0039

A single instituitional experience of 42 cases of pediatric cervical spine trauma from India : are they different from adult cervical trauma

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Introduction: Pediatric cervical spine injuries are relatively uncommon . Falls are the most common cause. Children have relatively high incidence of upper cervical injuries and their management includes conservative and surgical methods.
Objectives: This study was carried out to analyse the epidemiologic profile of pediatric cervical spine injuries and to evaluate the clinico-radiological characteristics of cervical spine injuries in children, to correlate the outcome with the clinico-radiological features.
Methodology: Prospective cum retrospective data analysis (2008-2011) at JPN apex trauma centre, New Delhi, India. 42 children (0-18 yrs) were operated during this period. Fall from height was noted in 27 cases, upper cervical spine injuries in 12/42 cases(odontoid fractures in 6 cases). Associated injuries were noted in 8 cases, preop ASIA A score was noted in 16 cases. Two cases had preop systemic hypotension and required ventilator support. Anterior only approach was used in 26 cases(61 %). Postoperative VAP was noted in 28 % cases, 38 % required tracheostomy, perioperative mortality noted in 2 cases. Implant failure on long term follow up seen in 2 cases.. 13 of 16 children who came for follow up had become independent for ADL(81 %) at a follow up range of 4-40 months.
Conclusions: Ligamentous injuries are commoner in pediatric patients, fall from height most commonly noted in Indian population, subaxial trauma more common than upper cervical trauma. 81 % had good outcome at last follow up. Such observation warrants aggressive surgical approach in pediatric population to give them better neurological outcome.

0040

CSF leak after spinal surgery- incidence, problems and management

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Introduction: CSF leak after spinal surgery is a serious complication. A simple technique of CSF drainage has been used by the authors' to treat this problem with good results.
Methods: The data relating children who underwent spinal surgery were obtained retrospectively. All were operated by the senior author.
The demographics, techniques used to get a water tight dural closure, primary closure vs duraplasty ,use of fibrin glue to reinforce closure, when the leak occurred and the management techniques were analysed.
Results: Of the 102 children studied 13 developed CSF leak. The dura was closed primarily in 71 and duraplasty was done in 31.The leak occurred between postop days 2- 6 in the majority. Fibrin glue was used in 4 instances after primary closure and in 24 after duraplasty to reinforce the closure. In the 13 children who developed the CSF leak fibrin glue was used in 7 and was not used in 6.
In the children with the leak LP drainage alone was sufficient to stop the leak in 7. Reexploration was done in 2 and lumboperitoneal shunt in 4 (3 for persistent leak and 1 for pseudomeningocele). Since we started using LP drainage we have stopped reexploration.
The technique of dural closure, checking for leak, reinforcement of closure will be presented. The simple method of continuous CSF drainage with an epidural anaesthesia catheter will be presented in detail.
Conclusions: Good results are obtained by the simple technique of placing a CSF drain and reexploration may be avoided.

10. Vascular – Oral Presentation

0016

The safety of the intraoperative sacrifice of the deep cerebral veins

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The effect of surgically ligating the deep cerebral veins is often thought to be of significant risk. The paucity of clinical information confounds surgical decision making when operations involve manipulation of the deep crebral veins. The authors review the human and animal litearature on the selective sacrifice of the deep cerebral veins. Robust experimental studies and limited clinical experience indicates that occlusion of one or several deep cerebral veins is generally safe. The reported consequences of edema and infarction to surgically occluding the deep cerebral veins appears to be related to brain retraction and direct trauma to adjacent neural structures.

0087

Evaluation of usefulness of regional cerebral blood flow measurements using 123I-IMP SPECT DT-ARG and ASL perfusion MRI in pediatric patients with Moyamoya disease

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Introduction: Recently, measurements of rCBF using ^{123}I-IMP SPECT is well established in the field of adult neurosurgery, not yet in the field of pediatric neurosurgery. Furthermore, 3 T-MRI is popular in daily clinical practice and Arterial Spin Labeling (ASL) is becoming increase in application.
Patients and Methods: In consideration of revascularization surgery for pediatric patients with Moyamoya disease, measurement of rCBF provides useful and essential information. In the present study, we measured qualitative rCBF in children before and after surgical treatments using ^{123}I-IMP SPECT dual table autoradiography (DT-ARG) method and ASL perfusion MRI, and analyzed the correlation during these data obtained from these children. We also compared these data with rCBF values from 202 healthy children volunteer (age 5-18 yo) using the same systems done at Institute of Development, Aging and Cancer, Tohoku University. The data of rCBF was analyzed by statistic analysis software (SPECT: 3D-SSP, ASL:SPM8 in MATLAB).
We measured 10 patients in DT-ARG(age 10-17 yo) and 14 patients in ASL(age 8-17 yo)
Results and Discussion: There was no remarkable difference among these rCBF values with pediatric Moyamoya patients obtained by both DT-ARG, ASL method. rCBF values in children with Moyamoya disease are lower than that healthy children wholly. Values in children with Moyamoya disease are higher than normal adults control in our series.
The ^{123}I-IMP SPECT DT-ARG method and ASL can be reliably used in younger patients with Moyamoya disease. These results suggested that analyzing rCBF by statistic analysis software provides useful information for the surgical planning of younger patients.

0211

Posterior cerebral artery involvement in moyamoya disease: a clinical ambush during long-term follow up

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Moyamoya disease (MMD) is a cerebrovascular occlusive disease mainly involving the anterior circulation. However, approximately 30 % of the patients have been known to show involvement of the posterior cerebral artery (PCA). Unlike the anterior circulation, PCA seems to show a wide spectrum of presenting symptom and onset. This study evaluated MMD patients with PCA involvement, focusing on those with late onset progression after completion of revascularization of anterior circulation.
A total of 389 patients operated on for MMD from January 2006 to July 2011 were reviewed. Thirty seven patients who underwent revascularization procedure of the PCA territory which had been hemodynamically intact at the time of anterior circulation operation were chosen.
The average interval between the initial operation and OA procedure was 4.9 years (range: 1.2~14.1 years). PCA progression was detected by symptom in 28 patients, whereas in 9 patients, it was first suspected in routine follow-up image studies. Most common symptom was headache followed by visual transient ischemic attack (TIA). Unusual presentation of motor TIA or involuntary movement was also noted. Complete resolution of the symptom was achieved in 66 % of patients and improved but remnant symptoms were seen in 21 %.
Data regarding the long term clinical course of MMD has not been accumulated. This study implies that even in patients who've been clinically and radiologically stable years after revascularization of the anterior circulation, physicians should not overlook general or atypical symptoms. Furthermore, follow up in rare intervals is recommended for MMD patients even years after the last operation.

0143

Paediatric Aneurysms a review of 38 cases from 2001 till march 2012

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Introduction: Though aneurysms are common in adults it is uncommon in paediatric population .There are only few series available present on it in literature .We are presenting our data from 2001 to march 2012
Materials AND Method: We have analysed data of 38 cases of aneurysm patients admitted from 2001 to march 2012. All patients were up to 18 years of age
Results: Out of 2433 patients admitted from 2001 to march 2012 of aneurysms 38 were of paediatric age group. There were total 44 aneurysms out of it 2 have three aneurysm and 4 have two aneurysm. Out of these 20 were clipped ,14 were embolized, 3 were already thrombosed, 1 patient died before treatment and rest of aneurysms are planned for embolization or patient lost to follow up. ICA bifurcation aneurysms were most common. Three aneurysms were post traumatic .
Conclusion: Paediatric aneurysms are uncommon compared to adult aneurysms, They usually present as SAH. The location frequency is different from adult aneurysms

0009

Is there best method for surgery for moya moya syndrom (MMS)?

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MMD is known to be a progressive occlusive disease of the cerebral blood vessels, mainly the arteries of the circle of Willis The development of paraventricles collaterals (Moyamoya blood vessels) is characteristic of this disease.
Most of our pediatric cases presented as cases of infarction. However some authors mentioned in the literature that bleeding is a common clinical presentation in pediatric cases. Repeated attacks of TIA is very common
There is no general agreement about the best surgical method for the management of Moyamoya. We are hereby presenting our experience of successfully treating 6 cases. the fellow up period is between one year and seven years. The method we choose is Encephalomyoarteriosynangiosis (EDAMS). 6 cases have been operated for only one side and one case was operated bilaterally

Management of Moyamoya Disease;
It is known that there is no medical treatment for MMD, so surgery is the only option.
In general terms, there are two main methods of surgery;

a. Direct anastomosis
STA- MCA anastomosis

b. Indirect anastomosis

- Encephaloduroarteriosyangiosis (EDAS)
- Encephalomyosynangiosis (EMS)
- Encephalomyoarteriosynangiosis (EDAMS) (our method)
- Pial Syngiosis and Multiple burr holes
- Omental graft

Reviewing the literature shows clearly that there is no best method for treating such patients, review the different methods of surgery will be presented.

0073
Less invasive bilateral or unilateral pedicled cranial-omental transposition with laparascopic omental harvesting for failed previous revascularization in pediatric moyamoya patients. Technical note
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Introduction: Moyamoya disease is characterized by idiopathic, progressive chronic occlusion of bilateral, ICAs, proximal MCAs and ACAs with the formation of so called moyamoya vessels at the base of the brain, and transdural collateral vessels attempting to compensate for the ischemia resulting from the occlusion. Extracranial to intracranial revascularization is the treatment of choice for this condition. However, there are patients who fail to respond to initial revascularization surgery and pose a difficult challenge to neurosurgeons. Several strategies have been proposed in order to attempt second revascularization procedures.
Methods: We describe a novel indirect less invasive, laparascopic omental harvesting technique for omental-cerebral transposition in children who failed prior indirect or combined direct-indirect revascularization procedures.
Results: Three patients with progressive neurological deterioration were treated using this technique. Omentum was laparoscopically harvested and tunneled subcutaneously to the cranial area. The pedicled omental flap was layed over the cortical surface and secured to the dura in order to obtain indirect revascularization. In one patient, bilateral transposition was achieved in one sitting. There were no surgical complications. Two patients clinically improved within the month after the procedure and in one patient neurological deterioration was halted. Angiographic revascularization was confirmed.
Conclusion: We describe for the first time a series of three children treated with a less invasive technique for repeated revascularization in moyamoya disease; a laparoscopic harvested omentum pedicled flap technique can be transferred subcutaneously to one or both hemispheres in a minimally invasive and safe manner. This technique can be used to treat patients that have had unsuccessful initial revascularization procedures for moyamoya disease.

0177
Complications associated with aneurysm surgery in children
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Introduction: Aneurysms in children are often large or giant in size and located more often in the posterior circulation as in adults. Children present with a subarachnoid hemmorrhage (SAH) or intracerebral hemorrhage (ICH) with a peak around the 2nd and the 10th year of age. We present difficulties in a series of 7 children treated for aneurysms.
Methods: Children were between 2 and 14 years of age. One child had multiple aneurysms, 6 children only one. Aneurysms were located at the anterior communicating artery (AComA) in 1, the internal carotid artery (ICA) in 1, the middle cerebral artery (MCA) in 3, and at the basilar artery (BA) in 1 child. Multiple aneurysms were located in the anterior, middle, and posterior cerebral arteries.
Results: Six children presented with either SAH or ICH, one child with an occlusive hydrocephalus due to a basilar artery aneurysm. This child was initially treated by insertion of a shunt followed by endovascular coil occlusion. 5 children with SAH/ICH were treated surgically. In 2 children occlusion of the parent vessel had to be performed. The child with multiple aneurysms died before treatment. One child was thought to have vasospasms and treated successfully by HHH-therapy.
Conclusion: Aneurysms in children are rare and in the majority of cases complex in terms of size and localization in the posterior circulation or peripheral branches. Fortunately, vasospasm is also rare, so that no prophylactic therapy seems to be necessary.

11. Oncology C – Oral Presentation

0218
Prospective study results of a therapeutic strategy sparing the hypothalamus in childhood craniopharyngioma
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Objective: The first aim of this prospective study was to determine whether a new neurosurgical approach, consisting of a risk-based treatment algorithm preserving hypothalamus with or without adjuvant radiotherapy, changes the prevalence of obesity in craniopharyngioma. Further objectives were to evaluate the prevalence of visual or hormonal deficiencies and tumour control.
Methods: Between December 2002 and September 2010, 66 patients were included in this protocole. Pre and post radiological, visual, hormonal and anthropometrical data were collected and compared with the results of our previously published study with intention of gross total resection.
Results: The mean BMI z score and the MRI hypothalamic involvement grades before surgery were similar in both series. After surgery, we observed a significant decreased of BMI z score in the prospective cohort ($p<0.0001$). There were no significant changes in the occurrence of growth hormone deficiency and central hypothyroidism between the two cohorts. However, incidence of corticotropic and gonadotropic deficiencies and diabetes insipidus, were significantly lower in the prospective cohort ($p<0.01$).
Conclusions: Our current results show that this new therapeutic approach, which spares the integrity of the hypothalamus, allows decreasing the occurrence of severe obesity, hyperphagia and endocrine deficits. The risk of relapse (4/66) is lowered in this prospective series but these results need to be assessed on a longer follow-up.

0295

C-MYC amplication of medulloblastoma promotes metastasis by recruiting cancer stem cell like characteristics

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Objectives: Recent transcriptomic analysis demonstrates that medulloblastoma is comprised of multiple clinically and molecularly distinct subgroups; WNT, SHH, Group 3, and Group 4. Group 3 medulloblastomas show very poor prognosis due to higher metastatic status (M stage) and genetically characterized as MYC amplication. However it is not clear how MYC works in the medulloblastoma cell. Hereby authors investigated the role of MYC in medulloblastoma cell.
Methods and Results: Medulloblastoma cell lines, UW228 and UW426 cells were used for assays and c-Myc over-expressing cell (UW228-Myc and UW426-Myc) was made by viral transfection. C-Myc over-expressing cells showed significantly higher proliferation rate than wild type cells. In cell cycle analysis, DNA contents in both UW228-Myc and UW426-Myc cells mainly accumulated in G2/M phase suggesting that cells expressing c-Myc overly have faster proliferation rate. In addition, the UW228-Myc and UW426-Myc cells demonstrated increased self-renewal capacities by colony-forming assay. Moreover c-Myc over-expressing cells increased migration ability and invasiveness at wound-healing assay and invasion assay using Matrigel chamber. Also, these cells showed a co-expression of c-Myc and cancer stem cell markers (CD133, Nestin, OCT3/4 and SOX2) by IHC and confocal microscopy. The higher expression of c-Myc showed, the stronger migration and invasion-related markers (p-AKT, p-ERK1/2 and Rac1) and cancer stem cell-related markers, especially SOX2 expressed. Orthotopic mouse model showed also worse survival curve in c-MYC over expressing cell.
Conclusion: MYC amplication in medulloblastoma cells may promote not only cell proliferation but also migration and invasion ability by recruiting stem cell like characteristics. MYC can be used for negative predictive biomarkers for survival in medulloblastoma.

0274

Multidisciplinary management of pediatric pituitary stalk lesions with special emphasis on surgical treatment

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Introduction: Primary Pituitary stalk lesions are rare and have explicit pathophysiology. Very limited literature is available and there is lack of clear guidelines regarding their optimal management in Pediatric age group.
Material & Methods: This study is review of prospectively collected data on primary stalk lesions being managed by multidisciplinary team at Alder Hey Children's Hospital.
Results: Total 18 patients were diagnosed and managed with primary stalk lesions in last 5 years. The average age was 15 years (Range 9-20). Male predominance was observed (13 out of 15). Diabetes Insipidus was presenting symptom in 72 %, raised intracranial features were observed in 27 %, visual impairment in 22 % and delayed puberty in 5 % patients. Surgery was carried out in 7 patients and remaining 11 patients received combination of chemotherapy, radiation therapy and hormone replacement. Among 7 operated cases, 3 had Pterional craniotomy, 3 patients subjected to EM guided endoscopic transventricular approach and 1 underwent stereotactic open biopsy. In surgical group the final histopathology was Germinoma in 6 and Langerhan Histiocytosis in 1 patient. There was no morbidity or mortality in this series.
Conclusion: Primary Pituitary stalk lesions should be managed in multidisciplinary fashion. EM guided transventricular endoscopic surgery is safe approach in experienced hands.

0232

Rare tumors

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Introduction: Rare tumors mean very infrequent tumors or tumors in very unusual locations
Objective: To present our experience in this infrequent pathology
Materials and methods: During the last 23 years we have operated 2143 intracranial tumors, from which: 25 were Atypical Teratoid / Rhabdoid Tumor (AT/RT), 14 Pleomorphic xanthoastrocytoma (PXA), 11 Gliomatosis Cerebri, 9 Desmoplastic Infantile Astrocytoma (DIA) and Ganglioglioma (DIG), 9 Pilomyxoid Astrocytoma (PMA), 3 Melanocytic Neoplasms, 3 Angiocentric Glioma (AG), 2 Papillary Tumor of the Pineal Region (PTPR), 1 Congenital Glioblastoma
Results: Rare tumors represented only 3.5 % of our series.
AT/RT is a very aggressive embryonal tumor. They regrew in all cases even with total resection and coadjuvant therapy; PXA: are alive and seizure free even the 4 cases where total resection was not achieved ; Gliomatosis Cerebri: bad results even with chemotherapy; DIA and DIG: all are alive without deficit after total resection; PMA: total removal 3/9, monitoring and reoperation if tumor regrows 6/9, chemotherapy in leptomeningeal dissemination; Melanocytic Neoplasms; all developed hydrocephalus and died 1 year after diagnosis; AG: are tumor and seizure free after total removal; PTPR: very recurrent and surgery is the only treatment. Both patients are in good neurological condition. One of them was reoperated 4 times; Congenital Glioblastoma: died just after surgery.
Conclusion: Since these tumors are infrequent, it is important to join the experiences of other teams around the world in order to establish the best treatment.

12. Brain Malformations – Oral Presentation

0162

Bleeding mechanism of sylvian arachnoid cyst: a finite element model analysis

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Background: Sylvian arachnoid cyst (AC) is a common benign disease and sometimes associated with bleeding without a major trauma. The purpose of this study is to investigate the bleeding mechanism of sylvian AC.
Methods: A new finite element (FE) model of the human head was developed and validated by comparing with cadaveric experiment studies. Two sylvian AC models with different size (mean-sized: 55.8 cm^3, large-sized: 75.2 cm^3) and their corresponding normal models were developed. To estimate the vulnerability to vein rupture, the reaction force between dura and arachnoid membrane was calculated

using the spot-weld constraint. Head injury was simulated with four different loading directions.
Results: Two FE models of sylvian AC showed significantly increased peak shear forces more than normal models. Between AC models, peak shear force in large-sized AC was only slightly higher except on posterior impact comparing with mean-sized AC. Peak axial force of AC model was more increased than normal model. Between AC models, peak axial force of the large-sized AC was higher than that of mean-sized AC. However, the difference of peak axial force was insignificant in all conditions. The pressure was concentrated on sylvian AC more than normal model regardless of direction of impact. The difference by AC size was not significant.
Conclusion: The results showed that bridging vessels on sylvian AC received stronger shear forces than those on normal brain, which may be a possible cause of frequent bleeding. The size difference of AC by 1.3 times did not have significant influence on vein rupture.

0219

Neuropsychological impact of isolated posterior fossa cyst

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Objective: Posterior fossa arachnoid cysts (PFAC) are rare. We wished to investigate the pre-operative neuropsychological status and the cerebellar perfusion by arterial spin labeling (ASL) MRI imaging in these children as well as the surgical results.
Methods: We conducted a prospective series on children with PFAC since October 2010. All of them had a neurological and neuropsychological assessment with the WPPSI-III and the WISC-IV tests according to age and the Purdue Pegboard test. All the patients had extensive MRI studies (with ASl when available (n=9) to differentiate between this entity and enlarged cisterna magna.
Results: Sixteen children (aged 3-17 yr) with a PFAC were included. The diagnosis was made on CT scan performed for headache (n=12), cerebellar and behavioral disorders (n=2), faint assessment (n=1) and behavioral problems (n=1). Preoperative Neuropsychological evaluation revealed difficulties in fine motor skill (16/16), learning (11/16), executive functions (8/16), verbal fluency (4/16) and behavioral disorders (5/16). The median total IQ was 99.2 (range 52-128). Nine children had academic delay of more than one year. On MRI, all the cysts were retro-vermian with a lateral extension in 5 cases. The 9 patients with ASL imaging had a decreased cerebellar perfusion. After surgery, all the patients showed a relief of their signs associated with dramatical improvement of the cerebellar perfusion.
Conclusions: Children with PFAC may be at risk for unrecognized developmental delay. Neuropsychological evaluation and perfusion MRI should be performed to identify patients who have subtle deficits that might be dramatically improved by surgery.

0080

Optimal timing of decompression surgery for foramen magnum stenosis in achondroplasia

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Purpose: Although tetraparesis with hyperreflexia and/or central apnea definitely indicate decompression surgery for foramen magnum stenosis in achondroplasia, hypotonia and obstructive apnea which are quite common without cervicomedullary compression could make it difficult to detect these typical signs. We retrospectively analyzed the operative results, to suggest optimal timing of decompression surgery.
Methods: Between 1994 and 2012, 12 achondroplasia children (10 girls and 2 boys; all sporadic) underwent foramen magnum decompression and were followed from 3 to 214 months (mean 70 months) after surgery.
Results: Four patients showed typical signs at the time of referral to us. Their onset age was before 1 month after birth in 2, 14 months in one and 2 years in one. They all showed severe foramen magnum stenosis with intra-axial T2 changes on MRI. Decompression was performed at the age of 5 months, 8 months, 14 months and 67 months. Although all 4 patients slightly improved after surgery, 2 of them did not get rid of ventilator. Other 8 patients were referred to us before onset. When they began to manifest mild signs due to cervicomedullary compression, such as normoreflexia without paresis and/or mild opisthotonic posture (limitation of neck flexion), MRI showed moderate cervicomedullay compression in all patients. Decomression was performed at the age between 7 and 16 months except one. All patients improved after surgery and caught up to almost normal development as achondroplasia.
Conclusion: Typical signs due to cervicomedullary compression could indicate too late for decompression.

0288

Clinical and neuroimaging outcomes of surgically treated intracranial cysts in children

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Objective: The indications and optimal surgical treatment for intracranial cysts is still controversial. The authors describe long-term clinical and neuroimaging results in children with intracranial cysts treated with various surgical options to contribute to the discussion of the debate.
Methods: Total 110 children underwent surgery for intracranial cysts between 1996 and 2011. Endoscopic cyst fenestration (ECF) was performed most commonly in 71 cases; microsurgical cyst excision +/- fenestration (MCEF) in 30; Cystoperitoneal (CP) shunt in 9. Long-term results were assessed retrospectively on the basis of medical and neuroimaging record.
Results: The most common intracranial cyst was arachnoid cyst (87.3 %: n=96), followed by neuroglial cyst (6), endodermal cyst (3), porencephalic cyst (3), choroid plexus cyst (2). In clinical outcome, 87.3 % of cases treated with ECF reported no or insignificant complaint (good result), and 12.5 % showed no improvement (fair) and 0 % noted a worsening of symptoms (poor); while MCEF showed good result (93.3 %), fair (6.7 %); CP shunt +/- craniotomy resulted good (89 %), fair (11 %) (p=0.71). In neuroimaging outcome, the cyst treated with ECF decreased in 92.7 %, unchanged in 2.9 %, and increased in 4.3 %. All cases treated with MCEF showed decrease of cyst volume, while the cyst treated with CP shunt decreased in 85.7 %, and increased in 14.3 %. There was no mortality and no permanent morbidity, but the complications such as shunt malfunction, infection, and subdural hematoma were noted in 56 % of shunted cases.
Conclusion: Endoscopic cyst fenestration is less invasive than, but at least as effective as open microsurgical methods. Endoscopic fenestration of the cyst seems the treatment of choice because of better outcome and a lower rate of treatment failure.

13. Trauma – Oral Presentation

0198

A national analysis of pediatric injuries related to child restraint seats: are children at higher risk for injury outside the vehicle than inside?

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Introduction: Widespread use of Child Restraint Seats (CRS) has been effective in decreasing mortality and morbidity associated with Motor Vehicle Collisions (MVC). However, anecdotes suggest the use of CRS has been accompanied by an increase in infant falls from hand-held carrier/car seats, which poses a significant risk of traumautic brain injury. The current study explores the frequency of CRS-related injures both inside and outside of motor vehicles.
Methods: The Canadian Hospital Injury Reporting and Prevention Program (CHIRPP) is a Canada-wide prospective emergency department surveillance program. A review was conducted in children under 1 year of age for the cause and location of injuries related to CRS use from 1995-2007.
Results: There were 4131 injuries involving CRS, and a remarkable 66.7 % of these occurred outside the vehicle. The most common factor in non-MVC related injuries was improper use of restraints while carrying the infant in the carrier/seat. Head injuries were the most frequent non-MVC injury, with almost 1500 injuries. The odds ratio for head injury was 42.7 ($p<0.0001$), a statistically significant finding suggesting that an infant in a CRS is far more likely to sustain a head injury outside the vehicle than in an actual MVC.
Conclusions: This national study suggests than an unintended by-product of widespread CRS use is injuries related to falls out of the CRS. This represents a previously unreported public-health issue affecting a substantial number of children. Education of the public regarding this issue, and promoting the proper use of CRS, will likely prevent many of these types of injuries.

0109

Head injury patterns and mechanisms in patients under 3 years old, a review of 519 cases with abnormal neuroimaging.

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Introduction: Published data regarding traumatic brain injury, either corroborated as accidental or confessed as inflicted, is rare.
Methods: 10 year retrospective review (2001-2010) of all patients under the age of 3 years with traumatic findings on neuroimaging at Auckland Starship Children's Hospital. Histories were assumed to be true. Injury patterns were analysed and trends identified; comparison was made with published corroborated and confessed data.
Results: Data was complete in 519/533 cases. Fall was the commonest mechanism (54 %), the majority occuring in the first year of life. Falls >2 m were rare under 15 months. The vast majority of cases were consistant with the history of an accident, and with published accidental injury data. A spike of subdural haemorrhages was identified under the age of 6 months. These did not fit the age profile for birth trauma in the published evidence. They were strongly associated with no history of trauma ($p<0.001$); a similar weaker association was also seen in the 6-36 month cohort with no history of trauma ($p=0.03$). Severe retinal haemorrhages were only seen in patients with subdural haematomas, and likewise did not fit published evidence for birth trauma or accidental injury. In children aged 6-36 months subdural haemorrhage was more likely to occur with falls <1 m than >2 m ($p=0.002$).
Conclusion: Inconsistencies regarding patterns of injury and reported history of no trauma or minor fall in this study cohort suggest that when traumatic intracranial pathology is encountered in young children, particulary infants, the mechanism of inflicted trauma must be seriously considered.

0115

Surgical results and outcome prognosticators in growing skull fractures in children: a single centre study of 26 cases

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Aims and objectives: To analyse the clinico-radiological features, surgical management, complications and postoperative outcome of growing skull fractures (GSF).
Materials and methods: A retrospective study was performed to include all patients below 18 years with a diagnosis of GSF treated at our institute from Dec 2007 to Mar 2012.Data regarding the demographic profile, clinico-radiological characteristics, surgical procedure, complications and outcome were noted.
Results: 26 children were operated (17 males, 9 females) over 4 yr period. Mean age-3.86 yrs (range 7 months-18 yrs).Progressive non tender scalp swelling was the most common symptom (n-25). By location, parietal (n-10) and frontal (n-9) were the most common locations while fronto-parietal (n-3), temporo-parietal (n-2) and occipital (n-2) were the other sites where the lesions were located.All patients had sustained fracture at their initial trauma. All had non contrast CT of the head at the time of admission. Duraplasty alone was performed in 3 patients while combined cranioplasty and duraplasty (PMMA bone cement-13, autologous split calvarial graft-6 and titanium mesh-3) was performed in 23 patients. Mean follow up duration was 22.38 months (2-50 months). Clinical and radiological follow up was available for 18 (69.2 %) and 17 patients (65.3 %) respectively. All children had good cosmetic outcome.
Complications included: CSF leak (n-3), meningitis (n-1), bone flap infection (n-2), redo- cranioplasty (n-1), new onset seizures (n-3).
Conclusions: Growing skull fractures are uncommon complications of skull fractures. Fractures in children should be closely followed up and timely management with good surgical principles helps in achieving good outcome.
Abbreviations: PMMA- Poly methyl methacrylate.

0112

Fatal paediatric head injuries, a twenty year review of Auckland cases

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Introduction: Traumatic brain injury is a significant cause of morbidity, and mortality in the paediatric age group, particularly those under 2 years old.
Methods: A retrospective review of twenty years of fatal head injuries through Auckland Starship Children's hospital and the Auckland department of forensic pathology. Cases were classified as accidental or inflicted using a corroborated history or confession, the child protection teams conclusion, and the Duhaime algorithm.
Results: 167 cases, 23 were referred to the child protection team, and 37 were classified as inflicted. Median age of 3.4 years. 56 patients <2 years old, significantly more in the inflicted group ($p<0.001$), where the median age was 1.3 compared to 5.0 years if accidental. The incidence of inflicted fatal head injury increased 4 fold over the study. Impact to the head was seen in over 90 % of cases. Subdural haemorrhage (SDH) was associated with both age <2 years ($p=0.006$) and an inflicted mechanism ($p<0.001$). Traumatic diffuse axonal injury (tDAI) was more often seen in the older children ($p=0.048$) in motor vehicle accidents, however of the 13 cases <2 years, all had evidence of impact, 7 of these cases in the absence of any history of trauma or with a falls, all <2 m.
Conclusion: For children under 2 years with fatal tDAI or SDH, and without a history of major trauma an inflicted mechanism should be considered and investigated appropriately. Evidence of impact is common regardless of the age or the cause of fatal paediatric head injury.

0038

Brachial plexus Injury in children - a study of 33 patients

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Introduction: Brachial plexus injuries usually result in a severe permanent handicap. These injuries represent a surgical challenge because of the complex anatomy of the brachial plexus, which is usually complicated by trauma induced changes.
Objective and Methods:The purpose of our study was to study all the patients of ≤18 years of age with brachial plexus injury operated, between April 2008 and March 2012, at our centre, an level - I. Trauma Centre in a India.
Observations: Thirty three patients, aged ≤18 years were operated at our centre for brachial plexus injury in 4 year period. Mean age at presentation was 15.1 (range 4-18 years). Boys constituted 79 % (n=26) of our patient population and girls constituting 21 % (n=7). High velocity injury was the commonest mode of injury, responsible for 82 % of cases. Panbrachial injury was the commonest, observed in 85 % (n=28) of patients. Others included 2 patients of cord injury and 3 patients of trunk injury. Mean duration between injury and surgical intervention was 6 months (range 2-13 months, SD±2.6 months). Mean follow up was 30.9 months (range 2-48 months). Twenty one patients could be followed up, and 60 % patients out of those who could be followed up showed improvement in muscle power, (MRC grade≥3/5).
Conclusions: High velocity trauma is the most common mode on injury. Neurotization was the most commonly performed surgery and 60 % of those who had followed up showed improvement at a mean follow up of 31 months.

0058

Study of children with cranio-spinal trauma in neurointensive unit: an apex trauma centre experience from India

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Introduction: Traumatic injuries are the leading cause of death and a major cause of disability among children. About 70- 80 % of the accidental deaths in paediatric age group result directly from central nervous system lesions.
Objective and Methods: The purpose of our study was to study all the patients 18 of ≤years of age with head or spinal injury admitted in intensive care unit at our centre, an apex trauma centre during a 15 month period.
Observations: There were 297 admissions of patients ≤18 years of age. Head injury accounted for 88 % of cases,the rest being spinal injury patients. Mild, moderate and severe head injury constituted 43 %, 14 % and 43 % of our patients, respectively. Mortality in head injury patients was 18.2 % and in spinal injury patients was 9.1 %. Mortality rate in children aged <5 year was 25 % as compared to 12.1 % in children 6 to 18 years of age (p value - 0.03). Mortality rate in severe head injury was 34.8 % as compared to 2.3 % and 7.5 % in mild and moderate head injury (p value - 0.04). Coagulopathy was seen in 24.4 % of children who died as compared to 1.6 % who ssurvived (p value - 0.03).
Conclusions: Head injury is much more common than spinal injury in paediatric patients and age ≤5 years, severe head injury and deranged coagulation parameters are predictors of high mortality.

0118

Decompressive craniectomy in traumatic brain injury in very young children - outcome study from a level 1 apex trauma centre

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All India Institute of Medical Sciences, New Delhi, India

Aims and objectives: To analyse the indications, complications and outcome of children undergoing decompressive craniectomy (DC) for traumatic brain injury (TBI).
Study design: Prospective cum retrospective data analysis of 51 children (<3 yrs of age) withTBI undergoing DC for intracranial hypertension between 2008 and 2011.
Observations: Mean age group was 1.4 yrs (1 month-3 yrs). Mean duration from injury to surgery was 12.4 hrs (3-37 hrs). Falls was the most frequent mode of injury (n-43). Admission GCS was as follows: <8(n- 30); 9-12(n-13); 13-15(n- 8). The most frequent intracranial lesion was acute subdural hematoma. Unilateral DC was performed in 47 cases. Bifrontal DC was done in 4 patients. Intracranial pressure (ICP) monitoring was done in 18 patients. Mean opening ICP was 16.5 mm Hg (10-35). Primary DC was done in 33 children while secondary (due to raised ICP) was done in 18 patients. Mean operating time was 140.6 min (range 60-270 min). Wide DC with lax duraplasty was done in all except 10 cases where only a slit durotomy was performed and bone flap was preserved in the bone bank as per institute protocol. Perioperative mortality was 47 % for severe TBI (16/30 in GCS <8). In those children where the opening ICP was>25 mm Hg, the mortality was 90 %. All children who survived had a good outcome (GOS E-7,8).
Conclusion: DC in severe TBI in very young children offers a survival advantage in almost 50 % of cases with good outcome (GOS- E).
Abbreviations: GOS E-Glasgow outcome scale extended.

14. Infection – Oral Presentation

0006

Pediatric cerebral abscess in children: a 15-year neurosurgical study

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Objective: To summarize the clinical manifestations and determine outcome of cerebral abscesses after neurosurgical treatment in a pediatric cohort.
Methods: A retrospective review of children diagnosed with brain abscesses from 1996 to 2011 was performed at the University Hospital of Murcia, Spain.
Results: Twenty children with a median age of 3.7 years were included in this study. The usual presenting clinical manifestations were fever, seizures, altered mental status and increased intracranial pressure. Neuroimaging disclosed tumor-like lesions in a subset of patients. 12 children had direct causal diseases, with suppurative meningitis as the most common cause. Causative organisms were identified in 17 patients with Group B streptococcus as the most common. 12 children had predisposing factors and otogenic infection was the commonest. All patients received antibiotic treatment while 18 patients had also surgical intervention, of them, nine had conventional craniotomy. The overall fatality rate was 10 % while 30 % of children had permanent neurologic deficit. CONCLUSION: While surgical treatment remains of key importance in most pediatric patients with cerebral abscesses, the effectiveness of medical management has improved and some children may be treated with antimicrobial therapy alone. Differentiation between tumors and tumor-like lesions of the cerebrum is essential for planning adequate treatment and for estimating outcome.

0224

The efficacy of antibiotic-impregnated external shunts in preventing ventriculostomy-associated infections

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Patients and methods: The efficacy of antibiotic-impregnated drains in preventing growth of bacteria from CSF-samples during ventricular external drainage was investigated during a four-year period in patients treated with external ventricular drainage.
In this retrospective cohorte study all patients treated with external ventricular drainage were identified in our patient administrative system and included in the study. All patients were treated with antibiotic-impregnated drains.
A total of 212 patients with 216 admissions and 334 episodes of external ventricular drain insertion were included. CSF-samples were analyzed on a daily basis. Bacterial growth was found in seventeen CSF-samples taken from sixteen patients (7.9 %). Three patients (1.4 %) had a diagnosis of ventriculitis. One patient had an postoperative intracranial abscess formation.
Results and discussion: The risk of CSF infection in EVD-patients varies greatly in the literature with reports between 0 % and 31.8 % The reduction in number of growth from CSF-samples is highly significant and confirms that antibiotic-impregnated drains are very efficient in preventing colonization with bacteria and that the incidence of ventriculitis following external ventricular drainage subsequently is very low.
It can be quite cumbersome to deal with positive CSF-cultures in daily practice, and to make a distinction between harmless contamination and ventriculitis is difficult also based on clinical signs and laboratory signs in these often very ill patients.
Conclusion: This retrospective cohort study showed that antibiotic-impregnated drains for external ventricular drainage can efficiently reduce the occurrence of positive CSF-cultures and ventriculitis to a level of 1,4 %.

15. Quality and Safety – Oral Presentation

0165

Evaluation of surgical complications after neurosurgical pediatric operations during 5-year period in Tampere, Finland

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Introduction: Pediatric neurosurgical patients are prone to surgical complications which accumulate in few patients. We evaluated how true this is in our neurosurgical unit.
Methods: We evaluated pediatric neurosurgical procedures performed during the five year period 2005 - 2009 in Tampere University Hospital, Finland. The evaluation was retrospective from 2005 to 2011 on patient records of children 0 - 15 years of age. This gave follow-up time from 2 to 7 years.
Results: There were 519 operations performed on 224 children. The operations were related to 243 CSF shunts, 75 ventricular drainages, 98 craniotomies, 13 ICP monitorings and with 90 other reasons.
120 patients were operated on once. 77 children had 2 - 4 operations, 24 had 5 - 9 operations and three were operated more than 10 times. 134 patients (60 %) had no surgical complications. 227 surgical complications cumulated on 90 patients (40 %).
CSF shunting was related to 175 complications (77 % of all). There were 83 blockages, 42 slit ventricles, 2 under drainages, 22 dispositions of ventricular catheters, 4 dispositions of peritoneal catheters, 1 disconnection, 12 infections, 4 multiple reasons and 5 other reasons.
15 postoperative surgical infections (2.9 % of operations) were related to 12 CSF shunts, 2 craniotomies and to one ventricular drainage.
There were 3 postoperative hematomas. Seven patients had major neurological deficits. 42 had various other complications. There was no operative mortality, but 12 patients died because of their diseases.
Conclusions: 40 % of pediatric patients experience neurosurgical complications. 77 % of complications develop after CSF diversions.

0278

Web-based Collaborative Interface to Decrease Surgical Errors

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Emergency patients arrive in the middle of the night with acute symptoms, at a time when most of the team may have already worked for more than 12 hours. Rapid decisions and actions may be called for, and under these conditions, medical errors are not uncommon [Freidman et.al., 2008].
After diagnosis, rapid decisions and plans to treat have to be made. Often the consultant responsible for the case is not on site, and therefore telephone discussions form the basis for decision-making. It is well-known in psycholinguistics [Svorou, 1994] that it is difficult to have a discussion involving spatial reasoning using spoken language without a

visual context, since deictic reference is missing. In this paper, the design and implementation of a WebGL based volumetric visualization system is described. This system enables surgeons to load and explore patients' imaging data and interact with these using 2D and 3D software tools; These tools allow, for example, to delineate a lesion, and annotate the image with markup symbols. The 2D annotations can consequently be displayed in a 3D view so that the lesion can be rapidly identified. This adds value to the decision-making process by providing the deictic references missing.
This support system enables surgical cases to be discussed anywhere with a computer and internet access, with the aid of diagrammatic and spatial reasoning tools, allowing residents to better understand how to prepare the case while the consultant is en route. The system allows for ubiquitous display of medical imagery and collaborative real-time annotations.

0012

Reducing surgical errors in endoscopic third ventriculostomy through simulation training: a canadian perspective

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Introduction: With recent technological advances, endoscopic third ventriculostomy (ETV) has become standard-of-care in managing obstructive hydrocephalus. However, ETV has a steep learning curve, and surgical inexperience is a key etiological factor for many procedural complications. Virtual reality simulation (VRS), free from patient-safety concerns, provides an ideal training environment prior to clinical exposure. This study was undertaken to identify the role, and essential instructional elements, of a VRS program for ETV designed to mitigate surgical errors.
Methods: We invited Canadian neuroendoscopists to complete a 10-item structured online questionnaire pertaining to the procedural steps for ETV, the frequency and significance of intraoperative errors, and simulation training modules of greatest potential to reduce these errors. Data was analyzed descriptively for both quantitative and qualitative responses.
Results: 32 of 58 (55.2 %) surgeons completed the survey. All supported VRS as an adjunt to clinical neuroendoscopy training. Identification of ventriculostomy site and navigation within the ventricular system ranked as the most important steps to simulate. Composite scores based on frequency and significance ratings reveal technically inadequate ventriculostomy, inappropriate fenestration site selection and failure to abort the procedure appropriately as the most important errors. A standard module and technically unsafe ETV scenario were felt to be most beneficial for resident training.
Conclusions: We have conducted a national survey of Canadian neuroendoscopists to clarify the role of a VST program for reducing surgical error in ETV. The results provide valuable insight to inform key design elements necessary to construct an educationally relevant simulator and training program.

0070

An effective and safe method of obtaining diagnostic mris of the central nervous system (cns) in very young neurosurgical patients without sedation or general anaesthesia (GA)

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Introduction: CNS MRIs are essential for management of neurosurgical conditions. Obtaining good quality images in infants without sedation and/or general anaesthesia is difficult, and not risk-free. We evaluate our method of obtaining diagnostic MRIs of the CNS without the need for sedation and GA.
Method: Neurosurgical patients requiring MRI were included in this study based on these criteria: i) age <4 months; ii) weight 2-7.5 kg; iii) term infants with no significant medical issues (those with respiratory distress, cyanotic heart, sepsis and seizures were excluded). Patients were fasted for 3 hours, then secured in a paediatric vacuum immobilization device, with heart rate and O2 saturation monitored continuously, without sedation. They were given a pacifer and fed intermittently with glucose water to settle them when needed. The number of patients who completed these scans successfully, time taken for scans and any adverse events related to the procedure or immobilisation were recorded.
Results: 58 patients underwent 69 scans (49 brain, 20 spinal; 8 patients had >1 scan). 57 of 58 infants successfully completed their scans. Time for completion of scans ranged from 15-100 mins, with average scan time of 39.75 mins (comparable to the average duration time for scans under GA in our institution). There were no adverse events. The quality of the images was acceptable to the requesting neurosurgeons.
Conclusion: Use of the vacuum immobiliser device with feed and wrap technique, without sedation or GA, is a safe, effective method for obtaining MRI images of acceptable quality in young infants with neurosurgical conditions.

0128

The use of intraoperative ultrasound in pediatric neurosurgery: a valuable tool for improving safety and decreasing surgical complications

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Introduction: Neuronavigation based on preoperatively acquired images, has become a standard planning tool in neurosurgery. Intraoperative ultrasound (IOUS) imaging offers the additional benefit of real-time basic navigation.
Methods: IOUS was used in 21 children (6 female, 15 male)(mean age of 1 y±2 months) at the Red Cross Childrens's Hospital between December 2010 and February 2012. IOUS analysis was conducted prior to dural opening, at various intervals during surgery and at completion of the procedure. In all cases a sterilised phased array (8 Mhz) and/or linear array (7-15 Mhz) probe attached to the iU22 ultrasound system (Philips, Bothell, USA) were used.
Results: The procedures performed were neoplasm resection (n=9), ventricular catheter placement for hydrocephalus (n=10), resection of cavernous hemangioma (n=1), bony decompression for Chiari 1 malformation (n=1). During neoplasm resections, the IOUS was useful in identifying tumor margins, confirming degree of resection (6 complete, 3 partial) and identification of blood vessels relative to the resection instrument. In the hydrocephalus group, ventricles and catheter placement were adequately visualised in all cases, with subsequent ventricular catheter position found to be optimal in 7 of the 8 (88 %) cases, as confirmed on post-operative CT scan. Bony decompression alone in the Chiari 1 malformation was sufficient to demonstrate CSF flow across the craniocervical junction, using IOUS. The additional time added per case was minimal (mean additional time=15±4 minutes)

Conclusion: IOUS is a very useful adjunct in a variety of pediatric neurosurgical procedures. It provides real-time basic navigation, good quality imaging and therefore, the opportunity to modify certain intra-operative surgical strategies, where necessary.

0176

Qualitative research in pediatric neurosurgery: uncharted territory

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Introduction: Quantitative techniques predominate in biomedical research. Assessment of health preferences, expectations, experiences, and outcomes may be enhanced using qualitative techniques, particularly in children. We examine the use of qualitative research in pediatric neurosurgical literature, and suggest ways to further incorporate it into pediatric neurosurgery research.
Methods: Electronic databases were searched for studies that used qualitative research techniques. MeSH headings of brain injuries, brain neoplasms, hydrocephalus, epilepsy, craniosynostosis, and spinal cord injuries were used. Spina bifida, traumatic brain injury, and brain tumors were added as keywords. Results were refined with qualitative and pediatric or paediatric as keywords.
Results: Only 31 articles were identified. Fifteen articles focused on traumatic brain injury, largely on sibling acceptance of TBI consequences. Spina bifida, brain tumors and epilepsy were equally as common, all focused on experiences of treatment outcome and social integration. Two articles included spina bifida patients alongside others with chronic conditions. None studied hydrocephalus. All but one study collected data using interviews; focus groups were conducted in the remaining study. Thematic content analysis was most commonly used; one study used narrative inquiry. None of the studies involved a neurosurgeon as principal investigator.
Conclusions: Qualitative research remains underrepresented in pediatric neurosurgical literature. Its potential for rich description, by our pediatric patients, of lived experiences and perceptions of illness and care should be appreciated. Qualitative research represents an untapped field that may provide great benefit to pediatric neurosurgeons, patients, and families.

0203

Review of neurological complications in the pediatric intensive care unit following craniotomy: Does my patient need to go to the ICU?

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Introduction: Post-operative admission to the ICU is often routine in patients undergoing craniotomy. Although the factors predicting post-operative complications (in craniotomy patients) have been explored in adults, these factors are not fully characterized in children. The purpose of this study was to explore the nature and frequency of serious early post-operative complications requiring intensive care management.
Methods: We conducted a retrospective review of patients<18 years old with an admission history of cranial surgery at British Columbia's Children's Hospital from 2008-2011. Emergency procedures for trauma, AVM hemorrhage and aneurysm were excluded from this review. Study variables included patient demographics, clinical history, operative details, and the number and nature of early post-operative complications requiring intensive care management.
Results: 65 patients were included in our review, of which 61 had an uneventful postoperative recovery, and one had an early CSF leak (the diagnosis or management of which was not specifically enhanced by the ICU stay). Amongst the 3 patients (4.6 %) with serious early complications, 2 patients required urgent medical imaging for loss of consciousness and new motor deficit (1 post-operative hematoma, 1 persistent hydrocephalus), and one patient required intubation/ventilation for an unexpected awakening delay (spontaneously improved). These 3 patients all had extensive anesthetic times (exceeding 450 minutes), and had undergone posterior fossa tumor surgery.
Conclusion: This study suggests that the children most at risk for early serious post-operative complications, including neurological and primary survey complications, are those with lengthy procedures, and specifically those involving the posterior fossa or brainstem.

NURSES SYMPOSIUM

0088

The crucial role of nursing management for prolonged external ventricular drain

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External ventricular drain (EVD)-related infection is one of the most common and serious complications, ranging between 0 % and 45 %. In addition, some authors stated that longer duration of EVD was a higher risk factor for the related-infection. The strict nursing management including shampooing and correct dressing has been reported to be associated with a lower incident of the infection. This study aims to evaluate our nursing protocol for prolonged EVD in terms of the related-infection and skin problem.
Between April 2010 and March 2012, 7 patients were treated with EVDs for 14 days or more in our facility. Two patients were admitted for EVD twice respectively. The age on admission ranged from 6 months to 31 years (mean 9.6 years). The average duration of EVD was 32.6 days (range, 21-41 days). All EVDs were performed due to shunt infection or malfunction. After EVD procedure, all patients were taken care of according to our EVD nursing protocol including regular shampooing & dressing procedure. All cases received ventriculoperitoneal shunt revision eventually without EVD-related infection. One case, 5 year-old female, presented with severe contact dermatitis due to dressing adhesive tape during drainage. Thus, she was needed skin treatment using steroid ointment as well as psychological care to minimize her irritability and anxiety.
In conclusion, we believe that the strict nursing management including revised skin care and psychological program for EVD would play an important role on prevention of the related-infection, especially for prolonged cases and lead to better outcome.

0091

Benchmarking paediatric neurosurgery nursing - presentation and workshop

Lindy May, Jennie Sacree
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Objective: The objective of the lecture and workshop is to describe and demonstrate how the benchmarking process can raise nursing standards and evidence based practice across International paediatric neurosurgery units.
Method: The lecture will describe how the benchmarking process works, why it is a useful and supportive process, and lead on to the workshop.

A thirty minute workshop will utilised to enable nurses to understand the benchmarking process. The paediatric neuroscience benchmarking group in the UK has been using the process for over 12 years and the session will be facilitated by two nurses from the group.
Two items will be benchmarked which will be familiar to nurses from the International setting- use of the Coma scale in paediatrices and care of an external ventricular drain.
Discussion: Benchmarking within paediatric neurosurgery can be used by nurses as a continuous process by which to compare, evaluate and challenge current practice."Best" practice must be based on collaborative agreement, professional consensus, comparison and sharing, and research / evidence based practice. The workshop will enable nurses to share and challange their own practice . At the end of the workshop, the possibility of utilising the benchmarking process within the ISPN nursing group will be discussed, and how this might be taken forward.

0185
Or nurses and child life specialist easing big fears in small patients
Esther Kho UY, Cecile
Montefiore Medical Center, Bronx, New York, USA

The prospect of going for surgery can be frightening to a child and overwhelming for parents. These feelings are accentuated by strange equipment, masked people and unfamiliar experiences. However with the help of OR nurses and Child Life Specialist, the surgical experience can become more familiar and welcoming for juvenile patients. This presentation is about how we at The Children's Hospital At Montefiore in the Bronx, New York, take care of our pediatric patients, from infants to teen-agers and their families before, during and after surgery.

0201
Promoting Pediatric Patient Safety in the Operating Room
Katie Thompson, Cecile
Montefiore Medical Center, Bronx, NY, USA

The focus is to identify and improve pediatric patient safety within the operating room. This is an on going concern amongst health care professionals in the operating room setting. Quality improvement and safety precautions are an ongoing process to produce the desired pinnacle outcome which is to prevent injuries and complications.

0244
Parents perspective of a child diagnosed with a brain tumour
Ainsley Moven
Great Ormond street hospital for sick children NHS Trust, London, UK

Brain tumours are the most common solid tumours that occur in children. Children of any age may be affected. About 400 children in the UK develop brain tumours each year. As a parent, the fact that a child has cancer is one of the worst situations they can be faced with. Emotions such as fear, guilt, sadness, anger and uncertainty, are all normal reactions and are part of the process that many parents go through at such a difficult time, (CancerBackup, 2005).
Nurses play a fundamental part in the process of breaking bad news and can help to make this process easier and give support to parents. However, we do not always take into consideration external factors, or social pressures that may influence their ability to cope with this potentially devastating information.
Proposal
To discuss parents perceptions of a child diagnosed with a brain tumour, using a case study to highlight the stresses parents face, and to influence nursing care.

- To highlight current practices at Great Ormond street hospital for sick children and nursing knowledge.
- To evaluate current research into breaking bad news to parents
- To help improve / influence Nursing care and standards.
- To give insight to all health professionals of the impact of diagnoses and parents responses.

0248
A not so minor head injury: a cautionary tale with a red herring
Becky Conway, Alison Duggan
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The admission of a child to hospital with a head injury for observation is commonplace. Many such children are observed and discharged home and suffer no significant or lasting harm from their injury. Vigilance on the part of nurses and doctors must always be practiced because seemingly "minor" head injuries can become catastrophic. This case presentation describes the admission of a 4 year old child to hospital with a head injury. The mechanism of the injury was not at first fully understood by all the people who were involved in this child's care. A fluctuating level of consciousness caused confusion amongst the child's many assessors. A fever provided a red herring and delayed correct diagnosis.
What can we learn from this tale? What are the cautionary elements for our nursing and medical practice and judgment?

0254
Advanced Paediatric Nurse Practitioners – the reality working as part of the medical team within a tertiary paediatric neurosurgical unit
Jenny Sacree
Frenchay Hospital, Bristol, UK

Background: With increasing demands on the modern British NHS to meet the European time directive for medical staff, along with education for junior medical staff and the increasingly fast turn over of patients, some specialised areas are looking to advanced nurse practitioners to supplement the workload of the junior doctor, providing long term experienced cover.
Within our unit at Frenchay Hospital, Bristol, England this has been practice for almost a year now, with medical cover provided for the 32 bedded unit by 4 advanced nurse practitioners and 6 middle grade medical staff ensuring cover 24 hours a day.
Methods: 2 questionnaires were used within the unit. 1 was sent staff (nursing and medical) working on the unit. A second questionnaire was given to all parents and patients who were on the ward for more than 2 days over a 2 month period during the beginning part of 2012.
Results: The results show a very positive reflection on the introduction of advanced nurse practitioners both from medical staff and patients and parents who had been admitted to the ward during the audit. Some interesting constructive feedback is being used positively to develop the role.

Conclusions:The introduction of Advanced nurse practitioners to replace the junior doctor has received positive feedback during audit from both medical staff, parents and patients and the audit is helping too constructively develop the role and build the next steps in this exciting project.

0255

The art of colouring…….oooops, i went outside the lines!!

Jenny Sacree
Frenchay Hospital, Bristol, UK

Accidental injury, including head injury, is common within the paediatric population. Head injury accounts for over 100,000 admissions to hospitals in England with 33 % of these episodes involving children under 15 year of age. Of these 45 % involve a fall and 33 % occur within the home (Tennant 2006).
This presentation reports an interesting single case of penetrating trauma to the head during normal play within the domestic environment, the ensuing journey through surgery and the patient's path to recovery.

0262

Posterior Fossa Syndrome

Lindy May
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Objective: To understand the predictors, pathophysiology and care requirements of children with posterior fossa syndrome.
Introduction: Posterior Fossa Syndrome occurs in 11-40 % of children following resection of posterior fossa tumours. Although there are no demographic or clinical predictors, the syndrome occurs most commonly following resection large midline medulloblastomas and is thought to be related to perturbation of dentite nuclei and their efferent pathways. Posterior Fossa Syndrome occurs 1-5 days after surgery and symptoms include mutism, ataxia, hypotonia and emotional lability. Long term outlook relates to the severity of the initial symptoms with many children continuing to have physical, language and cognitive deficits in the longer term.
Methods: A case study is used to illustrate the effects of Posterior Fossa Syndrome on the child and family, from pre operative assessment through to long term follow up.
Results: The literature suggests and the case study confirms that Posterior Fossa Syndrome may place the child at increased risk for physical, emotional, behavioural, and social problems long after completion of their cancer treatment often with devastating effects on the child and family.
Conclusion: The strengths, needs and goals for each child and family need to be identified to enable optimum provision of care and support.

0290

Nursing care and manangment in patients whit central nervous system tumors

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Introduction: Recent advances in diagnostic imaging, neurosurgical techniques and oncologic therapies provide a more optimistic outlook for practitioners, children with brain tumors and their families. These changes impact the nursing care of children, requiring neuroscience nurses to be aware of current treatment modalities. We present the role of the nurse facing children with CNS tumors in two leading tertiary level medical centers in Mexico.
Description: The Nurse is able to work in the diagnosis of the patient to relate to medical one and set up the treatment and care plan of each individual.
Each nurse must be familiar with the pathology, the prognosis depending of the biological behaviour of the tumor, the complications of the surgical, medical and also the oncologic treatment.
The nurse care include specific strategies to build up a self-confident patient whit the aid of the psychological therapy and the parents and family of the children.

0292

Radiologic And Clinical Outcomes Of Skull Fracture Presented In Children

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Objective: Skull fracture is one of well-known risk factors to predict intracranial hemorrhages. Authors aim 1) to describe children with skull fracture visited to emergency department (ED) and 2) to analyze the appropriateness of management of current guidelines.
Method: We retrospectively analyzed 76 patients who were diagnosed with skull fracture among 1,388 children who presented with head trauma at the pediatric emergency department from January 2010 to December 2011.
Results: Mean age of 76 patients with skull fracture was 39.3 months. Males are more prevalent than females by 1.53:1. The most cause of skull fracture was fall (56.6 %), followed by slip (15.8 %), traffic accident (13.1 %), hit (10.5 %), unknown (2.7 %), and violence (1.3 %). The leading causes of skull fracture changed by age; fall (0~5 years), slip and traffic accident (6~12 years), traffic accident (13~18 years). The reasons of visit to ED were scalp swelling (67.1 %), vomiting (30.3 %), decreased level of consciousness (26.3 %), scalp injury (23.7 %), headache (13.1 %). The types of skull fracture were linear (77.6 %), depressed (15.8 %), diastatic (3.9 %), and comminuted compound (2.6 %). Intracranial hemorrhages were noted 28 patients (36.8 %): epidural hemorrhage 12 (15.8 %), subdural hemorrhage 12 (15.8 %), subarachnoid hemorrhage 4 (5.3 %). Among 27 patients (32.9 %) admitted to the hospital, 6 needed surgery. Among 51 patients with normal Brain CT scan discharged home, none returned to ED without complication.
Conclusion: Abnormal Brain CT scan including intracranial hemorrhage reported in about 1/3 of children presented with skull fracture. But Children with normal Brain CT scan despite skull fracture may discharge home safely without fear of late deterioration

0310

The Starship experience of Slit ventricle syndrome

Stephanie Moore
Neurosurgery Nurse Specialist, Starship Childrens Health, Auckland, New Zealand

Introduction: Since the development of valve-regulated shunts in the 1950s many children's lives have changed significantly for the better. Along with new technology problems emerge that could not be

predicted at the outset. Slit ventricle syndrome is one such complication of hydrocephalus and shunting. A diagnosis can be difficult and delayed in many cases as children present to emergency departments symptomatic but with imaging that is interpretered as showing no evidence of hydrocephalus or shunt dysfunction.
Case review: A case will be presented of a seven year old boy who is an ex prem and diagnosed with hydrocephalus at age seven months and shunted at the age of eleven months. From the age of three he has had twelve shunt revisions; ten of the revisions were over an eighteen month period. At three years old he was diagnosed with slit ventricle syndrome. During his short life he has had thirty CT scans, five MRI scans and twenty three shunt series.
Conclusion: Slit ventricle syndrome (SVS) is a complex entity and at this time little is known about how to prevent this occurring. Pan et al (2007) looked at predictors of SVS at the time of first shunt insertion. They found the modifiable risk factors to be age at insertion of first shunt and valve type.
It continues to be imperative that children presenting to emergency departments and neurosurgical units symptomatic with signs of shunt failure are assessed on clinical symptoms rather than relying solely on radiological findings.

POSTERS

3. Dysraphism – Poster

0005
"Infected" Intraparenchymal Dermoids ; An Underestimated Entity

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Abstract

Background: Infection secondary to a dermal sinus most commonly occurs in the form of cutaneous, epidural or subdural abscesses. Rarely, it may result in an intramedullary absess as a result of a dermal sinus. A patient with dermal sinus frequently has a hairy nevus or dimple overlying the tract. Despite having cutaneous markers, these patients seek medical attention only after suffering from infective complications.
Methods: We present a clinico-radiological profile of 23 cases, harboring abscesses with in the dermoids and highlight the importance of dermal sinus, acting as a pathway for infections to enter the nervous system. The present series consists of all patients(n=23) less than 18 years of age, 20 having intra-spinal abscesses and 3 posterior fossa abscesses. Emergent exploration, pus drainage, minimal abscesses wall excision along with prolonged antibiotics administration remained the management of choice in all cases. All patients underwent post-operative contrast MRI scan during follow-up.
Results: *Methicillin-sensitive Staphylococcus Aureus* was the commonest offending organism. Seven patients recovered to normal neurological status, 7 showed no improvement, while 9 improved partially. Improvement in motor power was noted albeit partially, but bladder functions failed to recover even at long-term follow-up. Recurrence of abscess formation occurred in 2 patients, requiring re-exploration and pus drainage.
Conclusion: Even when such infective complications of dermal sinuses are rare, these are potentially serious and disabling. Hence, these have to be carefully considered and well managed for satisfactory results to be obtained.

0015
Surgery for functional tethered cord syndrome in elder children and young adults

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Introduction: Surgical indication for tethered cord syndrome for children who showed the conus at normal position (rostral to the L2 lower end) remains controversial. Result of surgical untethering for functional tethered cord syndrome (f-TCS: the conus at normal position) in children who can communicate their symptom was analyzed.
Methods: The authors operated on 59 f-TCS among 220 filum lesions (filum lipoma: FL, thickened filum: TF) during the last 10 years. Seventeen patients (Maged 7-29 y.o., median 11 y.o.) who were older than 7 y.o. at the time of surgery and followed more than 6 months were subjected for the study. Preoperative symptoms, spinal level of the conus, and postoperative results were analyzed.
Results: There were 14 FLs and 3 TFs. Main symptoms were 10 urinary incontinence, 2 repeated urinary tract infection, 2 inguinal pain and 1 urinary retention. Two patients had sign of neurogenic bladder without symptoms. Spinal level of the conus was as follows; L1: 9, L1/L2: 2, L2: 6. None had the conus rostral to the Th12. Postoperative improvement were observed 14 (11 FLs and 3 TFs) patients, 10 of them sensed improvement within 6 month after the surgery.
Conclusions: f-TCS could be surgically treated with relatively high success rate (14/17, 82 %). The conus at L1 and L2 can be regarded as borderline zone for the diagnosis of f-TCS.

0028
Complex dysraphic state: coexistence of myelomeningocele, hydrocephalus, Chiari II malformation, split cord malformation, scoliosis and syringomyelia. At least three points of spinal tethering

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Introduction: Spinal dysraphism can have a wide spectrum of manifestations, in isolation or in combinations of variable expression, which can produce multiple sites of spinal cord tethering and pause difficulties in surgical management.
Material: We present two children who had repair of myelomeningocele and shunt placement for hydrocephalus at birth, and later (at the age of 3 and 11 years respectively) presented with symptoms and signs of spinal cord tethering. Radiological examination showed the presence of tethered cord at the site of the myelomeningocele closure, diastematomyelia (SCM I) in the lumbar spine, Chiari II malformation, shunted hydrocephalus, syringomyelia and scoliosis. Both had diastematomyelia correction. One of had deterioration of leg function postoperatively, in association with minor enlargement of the syringomyelia cavity. Shunt revision improved the syringomyelia but did not reverse the clinical situation. Decompression of the Chiari II malformation was not performed as it was considered unlikely to improve the clinical situation.

Discussion: Complex dysraphic state can create at least three points of spinal cord tethering: "top" at the site of the Chiari II malformation, "middle" at the site of the diastematomyelia peg, "bottom" at the site of the closed myelomenigocele, where radiologically there are always adhesions. In the presence of clinical signs of spinal cord tethering, it is difficult to decide which site should be operated first. As Chiari II decompression is rarely required and re-exploration of closed myelomeningocele site has high CSF leak risk, it seems reasonable to correct the diastematomyelia first and reassess the clinical situation afterwards.

0037

Intrasacral meningocele: a personal series

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Intrasacral meningocele: a personal series

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Occult intrasacral meningocele refers to a dilated intrasacral extension of the thecal sac, which usually does not contain neural elements. The aim of this study is to review clinical and radiological features of the patients with intrasacral meningocele.

Fifteen pediatric patients with intrasacral meningocele who had been operated on by the author were reviewed in terms of demographics, symptoms and signs, radiological work-up, associated spinal lesions and outcome. All patients had MRI before surgery. The obliteration of the fistulous tract and plication of the meningocele were performed following a sacral laminotomy. In addition, associated spinal lesions such as a tight filum and split cord malformation were also repaired at the same surgical session.

There were 4 boys and 12 girls, ranged in age from 3 months to 18 years (mean 5.6 years). Skin findings and neurological symptoms and signs compatible with tethered cord syndrome were detected in the patients. All patients had at least one associated spinal lesion that may lead to tethering of the spinal cord, i.e., thick filum in all and split cord malformation in 8 patients.

In conclusion, intrasacral meningocele was more common in girls and associated with other spinal cord malformations. Therefore, all spinal column should be scanned by MRI and all lesions should be operated on at the same session.

0052

Rare association of congenital dermal sinus with arachnoid and ependymal cysts

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Introduction: Congenital dermal sinus (CDS) has been associated with demoid, epidermoid or neuroenteric cysts. Its association with arachnoid or ependymal cysts is extremely rare in medical literature. We report two such cases who had unique combinations.

Material and methods: A 3 year old male child presented with spastic quadriparesis with a trophic ulcer in the right great toe for one year.He harboured a CDS in the cervical spine since birth. Intraoperatively the sinus was associated with intradural cyst which proved to be ependymal cyst on histopathological examination.

A 5 years old girl had been operated for intradural extramedullary cervical (C3 & 4) arachnoid cyst at the age of 3 years. She continued to discharge CSF like clear fluid from the occipital region about 2 cm above the scar. MRI suggested presence of residual arachnoid cyst. She was managed with local dressing. However when the discharge did not stop after 6 months a CT was performed which revealed defect in occipital bone. She was re-explored when the sinus track was dissected till cervical subarachnoid space. The defect was repaired leading to healing of the wound.

Conclusion: CDS arises through faulty separation of neurectoderm from the overlying cutaneous ectoderm at the time of dysjunction. Ependymal cysts develop from evaginated ependymal rest cells of the ventricles while arachnoid cysts arise from duplication of arachnoid lining. These rare associations lead to dilemmas about embryogenesis while the definitive therapy would lead to long term recovery.

0102

Neural Tube Defects at King Hussein Medical Centre

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Objective: The aim of this study is to review cases of neural tube defect managed at K.H.M.C with special focus on presentation,epidemiology and clinical presentation.

Management with complications and results of surgery is discussed.

Methods: Ninety-three cases, born with neural tube defect (spina bifida aperta) were operated from June 1997 to October 2000.Data retrospectively reviewed and analysed.

Results: Major neurological deficits were the case in 28 cases (complete loss of function below the level of the lesion),19 cases were intact. Lesion size was less than 3.5 cm in 72 cases (77.4 %);3.5-7.5 cm in 15 cases (16.1 %) and 6 cases were more than 7.5 cm.

Seventy-two cases had an intact lesion before surgery while the other 21 cases ruptured either during delivery or later.

For the site of lesion; 51 cases were lumbar, 22 cases lumbosacral, 13 cases thoracolumbar, 4 cases thoracic and 3 cases cervical.

Early surgery was done for all cases;primary closure was possible in all cases.

19 cases had post operative complications;wound infection in 6 cases (7 %), CSF leakage 5 cases (5 %),Meningitis 3 cases (3 %),skin necrosis 3 cases (3 %) and 2 deaths.

Conclusions: Jordan has a large number of born spina bifida cases,as the practice of pregnancy termination is socially and religiously unacceptable.

Our approach to management is to repair all intact patients, for patients with major neurological deficits we advise family on the natural history of the disease and postoperative status of the patient leaving the decision to them.The presentation was similar to what is described in literature.

0129

Release of Tetherd Cord Syndrome for Patients with Progressive Spinal Scoliosis

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Introduction: The purpose of this study was to analyze the result, prognosis and complications of the untethering procedures for the patients who were scheduled surgical corrections of progressive spinal scoliosis.
Methods: Twenty patients underwent spinal cord untethering before the surgery to correct their progressive scoliosis. Outcomes were analyzed retrospectively.
Results: The primary pathology of the patiemts was 10(myelomeningocele) , 4(spondylocostal dysplasia), 2(filar lipoma), 2(sacral agenesis), 1(meningocele) and 1(symptomatic scoliosis). All untethering procedurers were performed under the neurophysiological intraoperative monitoring . No patient developed neurological deterioration postoperatively. Four patients showed neurological improvement after untethring procedures. In follow-ups, no patient suffered from neurological impairment after the correction of spinal deformity, even if they rapidly gained height postoperatively. Surgical complication rate of untethering was twenty percent; 2(pseudomeningocele), 1(cerebrospinal fluid leakage) and 1(ventriculoperitoneal shunt malfunction). Those complications required other surgical procedures.
Conclusions: Untethering procedures can be performed neurologically safely under neurophysiological monitoring. They may also prevent neurological morbidity of scoliosis surgery. Cerebrospincal fluid morbidity is ongoing issue of this procudure.

0237

Incidental Diagnosed and Endoscopic Assisted Microsurgically Operated An Anterior sacral meningocele Case in An Adult Male

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Introduction: Anterior sacral meningocele is a rare form of spinal dysraphism. Careful clinical examination is necessary to make early diagnosis.
Methods: We reported that an anterior intrasacral meningocele in a 40 years old male, incidentally. During investigations for constipation, magnetic resonance imaging showed anterior intrasacral meningocele. After the neurosurgical consultation, computed tomographic scans with intrathecal radiopaque injection demonstrated its localization and neck.
Results: We described endoscopic assisted microsurgically operation for partial resolution of the intrasacral meningocele in this case report. The postoperative course of our patient was characterized by disappearance of the preoperative constipation signs.
Conclusions: Anterior sacral meningocele is usually asymptomatic. It can present as constipation. Endoscopic or endoscopic assisted operation is an option for treatment of anterior sacral meningocele.

0252

Induction of symptomatic Chiari II malformation by rapid reduction of intracranial pressure

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Symptomatic Chiari malformation II (CMII) is a life threatening condition. To relieve hindbrain herniation in CMII, various reports recommend drainage of cerebrospinal fluid by ventriculoperitoneal shunts (VPS) and reduce intracranial pressure (ICP). However, we experienced two cases which indicated that rapid reduction of ICP could also induce symptom of Chiari II malformation.
First case was a month old boy. He suffered shunt infection, and his shunt was removed. Because of re-enlargement of the ventricle and bulged anterior fontanelle, VPS was placed again. 4 hours after surgery, this patient began to wheeze, and deteriorated rapidly. Another case was a month old girl. Cerebrospinal fluid (CSF) reservoir was placed at the same time as myelomeningocele was repaired. Later, her ventricle was enlarged with increased head circumference. CSF was tapped from reservoir intermittently. She did not show any symptom, and the procedures were repeated daily. 2 weeks later, immediately after CSF tapping, inspiratory stridor was audible, and she was drooling saliva. She deteriorated within a day. Both cases were eventually intubated and mechanically ventilated, and underwent foramen magnum and upper cervical decompression. Both cases gradually recovered after the decompression surgery, and were able to extubate. However, swallowing disturbance persisted for years.
Herniated hindbrain may create two compartments, cranial and spinal cerebrospinal fluid spaces. Damage to the medulla oblongata strangulated by surrounding structures may be exacerbated not only by raised intracranial pressure, but also by rapid change in pressure gradience between spinal and intracraninal compartment.

0273

The effect of ultra-early surgery on morbidity and outcome in myelomeningocele cases

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The effect of ultra-early surgery on morbidity and neurological outcome in neonatal myelomeningocele (MMC) was evaluated.
The data of total 260 MMC cases which, have been operated between 2000 and 2011 in two centers were retrospectively analyzed. Patient records on clinical features and operation timing were reviewed. The patients who had been followed up for at least 1-year postoperatively were included in the study.
The analysis of the data revealed that 66 of the 260 patients have undergone ultra-early surgery (within 8 hours after birth). This group was compared with the remaining 194 cases by means of surgical morbidity and neurological outcome. In the ultra-early surgery group, 6 % of the cases had wound problems at MMC repair site, where as the same ratio was found to be 13.4 % for the rest of the cases. According to the records of their neurological status and Spina Bifida Neurological Scale (SBNS) scores, ultra-early surgery group showed better results during the follow-up period.
The ultra-early surgical intervention performed within 8 hours after birth showed benefits regarding a lower incidence of postoperative wound problems and dehiscence as well as a better neurological outcome.

0285

CSF leak in operated patients of spinal dysraphism- a retrospective analysis of a complication

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Objective: To analyse the occurrence and management of CSF leaks in operated patients of spinal dysraphism.
Materials and methods: We analysed our series of children operated for spinal dysraphism (n=159) during the period January 2001 to December 2011 who had CSF leak (n=16). The age of the children ranged from 1 month to 6 years.
We analysed the details of this cohort of patient viz. age, sex, presentation, details of appearance of CSF leak. We analysed the technique used to manage CSF leaks and the issues associated with the techniques.
Results: We had 16 children (12 female and 4 male) who had CSF leak out of n=159 children with spinal dysraphism. Location of the tethering in all these patients was lumbosacral. None of the patient had associated hydrocephalus.
The techniques used to manage CSF leaks were as follows: Cystoperitoneal shunt (CPS) in 9, primary resuturing with rotation flap in 5, combined in 1 and conservative in 1. All the definitive techniques were usually preceded by conservative means of management. The complications of the techniques were as follows: 3 patients with CPS had shunt infection. Atleast 3 patients had releak and required resuturing. 12 other patients had good outcome.
Conclusions:
1. CSF leaks were all in lumbosacral spinal dysraphism
2. Various techniques can be used to manage CSF leaks in an operated patient of spinal dysraphism with CSF leak.
3. Conservative means of management have a high probability of failure.

4. Craniofacial – Poster

0032

Patent Foramen Ovale And Congenital Craniosynostosis: Management Considerations And Associated Risks

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Introduction: Patent foramen ovale (PFO) is a cardiac anomaly that can potentially allow emboli to travel from venous to arterial circulation, which could lead to coronary infarction or stroke. In congenital craniosynostosis, surgical repair has the risk of air embolism. PFOs often close on their own within the first few years of life, but craniosynostosis surgery is done before 12 months of age. Both early PFO repair and delayed craniosynostosis repair carry their own unique risks.
Methods: Inclusion criteria were patients with craniosynostosis and PFO treated with a multidisciplinary approach. The treating team includes a neurosurgeon, a craniofacial plastic surgeon and an interventional cardiologist.
Results: *Patient A*. 2-year-old with Jacobsen syndrome including metopic craniosynostosis and cardiac anomalies including PFO. He received percutaneous PFO occlusion several months prior to craniosynostosis repair. Postoperatively, he did very well and was discharged home without complications.
Patient B. 9-month-old with metopic craniosynostosis and PFO whose cardiac anatomy did not allow early patching. Instead, the PFO was temporarily occluded with balloon catheterization during a simultaneous craniofacial correction surgery in the hybrid operating suite. During early postoperative period, the patient was noticed to have a mild hand weakness. MRI confirmed a small acute infarct near internal capsule. Radiographically and clinically, the infant recovered very well.
Conclusions: Patients with simultaneous craniosynostosis and PFO are unique and complex, requiring a thoughtful and individualized approach. Different management considerations include percutaneous endovascular occlusion prior to craniosynostosis correction or simultaneous temporary balloon occlusion of PFO during craniofacial correction.

0048

Cranial vault remodelling in a series of 100 children: immediate results, complications and long term prevention of chiari malformation

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The surgical technique (suturectomy versus open surgery) for sagittal synostosis (SS) correction is still discussed, as well as its neuropsicological and cosmetic results. The present review concerns 100 consecutive operations for SS. Mean age was 10 months (3-36). All diagnosis were confirmed by 3DCT. Multiple craniectomies were performed with high speed drill, by a bicoronal zig-zag bicoronal approach; a key role was played the transverse interruptions on the central sagittal flap, that allowing the vertical reshaping. Plates were used only in 4 older babies. All the children, but two, were submitted to blood transfusion, with an early prehemptive protocol. In none a genetic mutation was documented, so excluding complex craniosynostosys. Good functional and cosmetic results was obtained, with a better reshaping in younger children; 2 patients were re-operated for restenosis, one pterional and the other occipital. The complications were: 1 progressive bone defect due to dural tearing and 1 CSF collection, requiring reoperations; there was no mortality, neither infections. In the last 80 cases, no child need Intensive Care, the mean time for feeding was 3 hours after surgery and mean hospital staying of 4 days. At a long tem RM follow-up, performed in 80 cases, none presented CM1. The cranial reshaping described had good results, rapid recovery and good correction of both cephalic and vertical index. The SS correction had a functional meaning, lowering the risk of CM1 late occurrence: this is due to the volume correction, that can be obtained by the cranial vault remodelling.

0061

Complications in craniosynostosis surgery

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Objective: Review the complications in the surgical treatment of craniosynostosis in 23 consecutive procedures between August 2009 and April 2012.
Patients and methods: Surgical series consist of 24 procedures done in 23 patients: 8 scaphocephalies, 1 trigonocephaly, 4 anterior plagiocephalies, 2 Turri-brachicephalies, 1 occipital plagiocephaly and 7 multisutural synostosis (5 whit Apert syndrome). Complications and time of hospitalization were recorded. Surgical procedures were classified in 11 different types according to the technique and the affected suture.

We done conventional (suturectomies, barrel stave, fronto-orbital advancement, bone transposition and wide craniectomies) and modified (spiral osteotomies as a variant for radial or sunrise osteotomies) techniques previously described along the evolution of the surgical management of the craniosynostosis. In most of the cases absorbable plates and screws were used to mantain the bone flaps in situ.
Results: One patient died during the surgery due to respiratory and cardiogenic failure. All complications resolved without permanent deficit. Mean age at surgery was 8.9 months. 95 % of the patients needed blood transfusion whitout adverse effects during the surgery or in the postoperative period. Most frequent transoperative complication was dural tear followed by brain contusion, and postoperative complication was subcutaneous haematoma and minimal cranial vault defects. Highest number of complications was related to complete cranial vault remodelling in multiple synostosis. Mean follow up of 13 months.
Conclusions: In our initial experience the percentage and severity of complications related to the surgical procedure remains lower in single suture synostosis and is higher among patients going for multiple suture surgery.

0062

Avoiding the uggly scars: The use of undulated incisions in pediatric cranial surgery

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Background: Classical scalp incisions are linear on different shapes creating visible non-hair covered scars. This represents an important emotional and psychological impact in children undergoing cranial surgery.
Methods: Since 2010 we have performed more than 200 cranial surgeries using undulated incisions for emergent and elective craniotomies, post fossa, and reconstructive surgeries.
Result: Cosmetically acceptable results with hidden scars have been obtained for the satisfaction of parents and patients. The use of undulating incisions can be made without adding surgical time or complexity to the procedures.
Conclusion: By using undulating incisions we can easily improve the quality of the postoperative time for the pediatric patients and their parents by reducing the stress of explaining an explicit scar on the scalp.

0137

Hominid Evolution of the Inner Ear and Its Relationship to the Cranial Base

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Introduction: The human labyrinth appeared 1.9 million years ago in *Homo erectus* species. This derived system packaged the basic mechanism for unconscious perception and movement.
Methods: This paper explores the labyrinth's derived constraints allowing function/ amplification/structure to be conserved, nearly 2 million years.
Results/Discussion: Sensory information controls the vestibular system's orthogonal semicircular canals' (SCC) angular rotation of balance/navigation; their planes, anterior (ASC), posterior (PSC), lateral (LSC), are designed for *optimum* perceptive response. Sensitivity increased proportionally to arc size(mm) of each SCC's radius: ASC, PSC, LSC, respectively, *Pan*: 2.7, 2.8, 2.5; *Australopithecus*: 2.4, 2.6, 2.2; *Homo erectus*: 3.2, 3.2, 2.1; *Homo sapiens*: 3.2, 3.2, 2.3. This **functional constraint** gave *Homo erectus* enhanced ability to detect movement.
The labyrinth's cochlea evolved independently for maximum frequency range/amplification of sound responses, its 350Mya basilar papilla auditory receptor the basis for parallel divergence/sound amplification (Hz): turtles, 0.8 Hz; lizards, 8 Hz; birds, 12 Hz; mammals, >100 Hz. Primates coiled cochlea length, proportional to audible octave ranges, gives them highest cochlear volume, $p<.005$. Hearing capacity, as **amplification constraint**, is strongly correlated with locomotion.
Homo erectus' petrous bone encased labyrinth exhibited a derived/ distinct petrous-tympanic angular relationship, foramen rotundum to LSC, exemplifying phylogenetic change (degrees): mammals, 5-30; great apes, 44-46; *Homo erectus*/humans, 90. Petrous **structural constraints** influenced/produced differential CB growth for species specific synchondroses asymmetries.
Conclusion: The human labyrinth appeared 1.9 million years ago in *Home erectus,* enabling the most significant migration to shape human genetic diversity; these derived functional/amplification/ structural constraints are a legacy to our *Homo sapiens* species.

0142

Familial nonsyndromic craniosynostosis with specific deformity of the cranium- A case report

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An otherwise healthy, developmentally normal 3-week-old male presented with complex multi-suture craniosynostosis involving the metopic suture and bilateral coronal sutures with frontal prominence and hypotelorism. Frontal craniectomy and bilateral fronto-orbital advancement remodeling were performed at the age of 5 months. Postoperative course was uneventful. His development was normal up to 8 months after the operation. His father and grandfather had similar specific deformities of the cranium, but no anomaly of the extremities was found, and conversation suggested their intelligence was normal, probably excluding the possibility of syndromic craniosynostosis. DNA analysis of the patient and his family revealed large scale copy number polymorphism of chromosome 4 which may include the phenotype of the cranium, and absence of TWIST1 mutation in the sequence from 291 to 1087 that includes DNA binding, Helix1, Loop, and Helix2. The present patient apparently had a rare case of familial nonsyndromic craniosynostosis. We are planning further genomic analysis of this family and a long-term observation of the craniofacial deformity of this patient.

0171

Treatment of children craniosynostosis- Experiences from China

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Objective: The craniosynostosis is rare, but it has adverse impact on children. The purpose of this study is to assess the different surgical approaches to treat the craniosynostosis.
Materials and Methods: We reviewed 90 patients with craniosynostosis treated in our unit from 2000 to 2012. Age span from 3 months to 3 years old. All patiens use 3D-CT scan reconstruction and MRI to assess the development status of the patients' cranium and brain. In 90 patients, there are 10 patients with frontal suture closure, 13 patients with unilateral coronal suture closure, 11 patients with bilateral coronal suture closure, 24 patients with sagittal suture closure, 10 patients with multiple suture closure, and 22 patients with Crouzon syndrome. All patients underwent the craniofacial reconstruction surgery to restore the cranial head shape.
Results: All patients underwent a long term follow-up from 12 months to 60 months (5 years). Their craniofacial appearance is satisfactory by their parents. The intellectual development and motor development is equal with the other normal children.
Conclusions: The methods of craniosynostosis surgical treatment is varied. We believe that the craniofacial reconstruction surgery is a effective surgical approach. Some craniosynostosis patiens combined with hydrocephalus or Chiari I malformation need two-stage operation, first stage is V-P shunt and posterior cranial fossa decompression,and second stage is craniofacial reconstructive surgery.

0172

Raised intracranial pressure post cranial vault remodelling for nonsyndromic sagittal synostosis

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Isolated sagittal suture craniosynostosis is the most common form of craniosynostosis. Currently, there are reports of recurrent raised intracranial pressure in patients with syndromic and often multi-suture synostosis but only isolated reports, often limited to case studies of its development in single suture synostosis. In such cases recurrence had been attributed to either to patient's age at surgery or the extent of the procedure.
We report our experience in 10 patients with raised intracranial pressure requiring repeat cranial vault remodelling between Jan 2001 and December 2011. These patients had previously undergone cranial vault remodelling for nonsyndromic, single suture sagittal synostosis. We reviewed the timing of their procedure, type of procedure performed, the preoperative morphology and the genetic screening results but found no clearly identifiable predictors for the subsequent development of raised pressure. We conclude that it is difficult to predict which patient may develop raised intracranial pressure requiring further surgery and therefore our findings highlight the need for long term follow up in all patients with corrected sagittal synostosis.

0181

Craniosynostosis – Techniques and outcome: A Institutional study

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Craniosynostosis – Techniques and outcome: A Institutional study

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Introduction: Craniosynostosis is a eminently correctable problem though oft-neglected in our country. In this article we discuss the experience at our institute regarding the surgical management of craniosynostosis.
Material and Methods: This retrospective study included 36 patients who underwent surgery over a period of 7 years. The patient's records were obtained from the medical records. The demographic profile, clinico-radiological features, various aspects of surgical management, outcome and long-term follow-up were analysed.
Results: There were a total of 36 pts (9 – sagittal suture, 18-coronal suture,2- metopic suture, 7- multi-sutural including 1 case of Aperts and 2 of Crouzon syndrome) operated at our institute. All patients with Brachycephaly/Plagiocephaly/ syndromic craniosynostosis underwent fronto-orbital advancement. We used either titanium or bioresorbable plates. The average duration of surgery was 176 min and blood loss 268 ml. The average age of surgery was 9.8 months. 8 patients had dural tears which were repaired. There were no postoperative CSF leaks. One patient had delayed wound infection (after 1.6 years and was managed with antibiotics and dressings). There were no long term complications. The average duration of follow up was 2.6 years)
Conclusion: In this paper we present our experience with craniosynostosis, review the surgical techniques used and present operative videos and review long term follow-up and outcome.

0225

Staged cranioplasty to encephalocele by using distraction procedure - case report

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Cranium bifidum is a congenital malformation in which the brain or meningeal tissue comes out through a defect in the skull, and it has been reported that no bone formation at the defect was seen in many cases. This is a report on a certain case the author experienced where cranioplasty was performed using titanium mesh after conducting cranial expansion to address bulging of brain from the defect in the skull after encephalocele repair. An infant patient was referred to our hospital because of the presence of a parietal encephalocele. Since the tension at the encephalocele grew and when it is 15 days old we performed excision of the encephalocele. Although postoperative course was favorable, the diameter of the parietal defect was as large as 6.5 cm and the parietal region gradually became protruded from the defect edge. There was no development of hydrocephalus but it was feared that repositioning of the brain as it is might cause cerebral contusion. So, cranial expansion was carried out when the infant was 7 months old, using a distraction device, and after increasing the cranial volume, cranioplasty was performed when it was 10 months old, using titanium mesh. One year has elapsed since the operation and the patient is doing well.
There are reports about giving the brain that protruded after encephalocele surgery a ventriculoperitoneal shunt to reduce the size of cerebrospinal fluid space before repositioning. This time, however, we purposely opted to adopt the method of repositioning after increasing the cranial volume.

0226

The assessment of relationship between the skull base development and the severity of frontal plagiocephaly after bilateral fronto-orbital advancement in the early life

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Introduction: We analyzed the skull base development in the patients with unilateral frontal plagiocephaly (UFP) who underwent fronto-orbital advancement (FOA) in the early life during the last decade.
Methods: We assessed the treatment results and outcome of FOA performed in 6 patients, 4 girls and 2 boys younger than 2-year-old, in the last decade. Also, the basal cranium's angles were measured by 3D reconstruction images on CT scan. The severities of UFP were assessed by the classification of Di Rocco and Velardi.
Results: The mean patients' ages at FOAs was 11 months. Two cases were classified as grade 2A, one case as grade 2B and 3 cases as grade 3. The ethmoidal axis was deviated a mean of 8.2 degrees (5-11 degrees) to the affected side. The mean angle between the petrosal pyramids and the midline (anterior-petrosal-sagittal angle, APSA) was 75.3 degrees (70-80 degrees) on the affected side and 66.2 degrees (62-70 degrees) on the normal side. The mean difference of APSA was 9.2 degrees (2-15 degrees). On the follow-up CT images 5 years after surgery, the deviations of the ethmoidal axis clearly decreased, 5.7 degrees (3-8 degrees), but the differences of APSA did not change, 8.8 degrees (1-18 degrees).
Conclusion: The midline distortion of anterior skull base should be considered to be spontaneously corrected during the follow-up periods in patients with UFP who underwent FOA, unlike posterior skull base. The relationship between the skull base development and the severities of plagiocephaly was not clearly detected.

0253

Anthropometric changes in the skull base in children with sagittal craniosynostosis submitted to surgical correction

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Introduction: Craniosynostosis is defined as the premature closure of one or more sutures, leading to redirection of the craniofacial growth and deformity of the skull. This study aims to perform the anthropometric measures of the skull base in children with scaphocephaly to evaluate the influence of surgical repair in the remodeling of the skull base.
Patients and Methods: Twenty-one children with clinical and radiological diagnosis of scaphocephaly were operated consecutively, and anthropometric measures at the base of the skull were performed before and after a year of surgery. The measures were the cranial index (CI), distance between the crista galli and tuberculum sellar (CG-TS), distance between the crista galli and the internal auditory meatus (CG-IAM), distance between the oval foramen (OF-OF) distance between the internal auditory meatus (IAM-IAM), the angle of the skull base (Â1) and the angle between the nasion, center of sella and basion (Â2).
Results: There was a normalization of the CI in all children, confirming an appropriate cranial remodeling. The CG-TS measure evaluated the anterior skull base, with proportional growth of 12.5 %. The mediolateral growth was observed by the increase of OF-OF measures by 8.5 % and IAM-IAM by 9.5 %. The CG-TS measure grew by 7.2 %. There was no statistical difference in the angles analyzed.
Conclusions: Surgical treatment of scaphocephaly led to remodeling of the skull base, confirmed by the changes of anthropometric measures taken before and after a year of surgery.

0270

Paediatric Craniosynostosis; A Review of Craniofacial Clinic Activity and Site of Synostosis

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Introduction: Craniosynostosis occurs in 0.05 % of the population. The consequences of craniosynostosis may be functional (restriction of brain development or raised ICP), or cosmetic. We review the workload of a single-centre craniofacial clinic over a 30-month period.
Methods: Frequencies of common pathologies are explored. Incidence of synostosis is analysed by suture site. Site of synostosis is plotted versus likelihood of deciding to undergo remodelling surgery. Results are compared with the literature.
Results: 440 paediatric patients were reviewed during the 30-month study period, of which 399 had been adequately coded within the databases searched. Non-syndromic craniosynostosis accounted for 44 % of cases. Other presentations included positional plagiocephaly (22 %), dermoid cysts (4 %), post-traumatic defects (3 %) and intrinsic skull tumours (3 %).
Sagittal synostosis was most common (39 %), followed by metopic (31 %) and coronal (22 %). Of patients who had outcomes coded 64 % elected to have surgery; most that did not had cosmetically 'mild' synostosis. Site of synostosis affected the decision operate; 100 % of complex synostosis cases were operated on, 71 % of coronal, 65 % of sagittal and 49 % of metopic.
Conclusion: Our data shows rates of metopic synostosis that are higher than typically quoted in the literature; we hypothesise that this may be partly related to the ethnic profile of our patient cohort and further investigation into this is being undertaken.
64 % of patients/parents elected to undergo surgery, the indication being cosmetic in the majority of cases. Patients with complex, coronal or sagittal synostoses are more likely to pursue surgery than those with metopic synostosis alone.

5. Hydrocephalus – Poster

0007

Fungal granuloma following endoscopic third ventriculostomy

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Introduction: Endoscopic third ventriculostomy (ETV), is increasingly being performed in early infancy. Though a safe procedure, ETV has several known complications including infection.
Case Report: A 3 month old female child, born at 32 weeks gestation, with no history of meningitis was referred with increasing head size, vomiting and downward gaze. A brain CT scan showed tri-ventriculomegaly. An ETV was carried out uneventfully with good recovery. She presented again with similar symptoms after 7 months with the repeat CT scan showing tri-ventriculomegaly as before.
A repeat endoscopy showed an opaque floor with no stoma and a small white nodule seen loosely adherent to the left mamillary body which was

removed. A fresh stoma was made but, as the surgeon felt that the floor pulsation was unsatisfactory, went ahead with a ventriculo- peritoneal shunt. The CSF sent during the procedure was normal but the biopsy of the nodule revealed a fungal granuloma, probably candida.
In view of shunt hardware being present, it was decided with the concurrence of the pediatricians to give a 2 week course of amphotericin which the child tolerated well.
The child was well 18 months after the shunt.
Conclusion:Fungal granuloma is a hitherto undescribed complication following ETV. The maintenance of sterile precautions cannot be overemphasized. The detection of fungus in the ventricular system, even in asymptomatic situations, needs to be aggressively treated, especially in the presence of shunt hardware.

0008

The Dilemma of Postinfection Hydrocephalus

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Multiloculate ventricle is a serious complication of post infection hydrocephalus.
We did deign a research in order to understand the pathophysiology of postinfection hydrocephalus and loculated ventricles. The pathophysiology takes several stages such as; Vasculitis and occlusion of cortical blood vessels followed by brain edema and Increase Intracranial pressure subsequently in later stages loculation of the ventricles may occur by formation of membranes and migration of collagen cells. Cloudiness or sometimes obstruction of subarachnoid space and skull base adhesions and occlusions of FM and F L may cause hydrocephalus
Management strategy; Every case should be treated according to the type of hydrocephalus. We should consider that cerebral insult in because of the infection is not only caused by infectious organism but caused by host antibody antigen reactions. Therefore, the timing and methods of treating hydrocephalus has to be scientifically calculated
Conclusion: Understanding the pathophysiology of meningitis and post infection hydrocephalus is the key for proper treatment
The cascade of infection do not end by killing the bacteria, therefore it is important to consider the timing of shunt or ETV
The cascade of infection do not end by killing the bacteria, therefore it is important to consider the timing of shunt or ETV
VP shunt + ETV + Operative CT-Scan and Neuronavigation are among the useful tools
In some cases, the rush of insertion shunt is not a wise decision

0010

Complications during and after pediatrics neuroendoscopic techniques. 10 years follow up

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Introduction: Neuroendoscopic techniques are now being performed more frequently, and with advancement in technology, complications related to the procedure and equipment's have also minimized. We report our experience with 144 pediatric patients who underwent intracranial neuroendoscopic techniques.
Materials and Methods: The rates of various perioperative and postoperative surgical complications, during intracranial neuroendoscopic surgeries were studied. Data collected included patient's medical history and any associated conditions, diagnosis, procedure performed, intraoperative and postoperative complications and outcomes.
Results: Of the 144 patients studied, all were pediatric (age <18 years). Cardiovascular complications (such as tachycardia 18.8 % and bradycardia 11.3 %, were the commonly observed complications during intraoperative, also small hemorrhages 25 % and pneumoencephalus 15 %. Postoperative frequent complications included: fever (32 %), tachycardia (26 %), nausea and vomiting (14 %). Potentially fatal complications such as intraoperative massive hemorrhage or air embolism, were not observe in our serie. Most of the complications were transient on time and self-limiting.
Conclusion: Neuroendoscopic techniques are considered minimally invasive, but at times may lead to life-threatening complications and one should be aware of them.
Keywords: Neuroendoscopic techniques, surgical complications, intracranial surgery, minimally invasive, neuroendoscopy.

0014

Surgical complications in neuroendoscopy

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Objective: Despite being a minimally invasive procedure, serious complications are reported during neuroendoscopy surgery, often generated by its unique surgical maneuvers. We report the complications of our experience in elective neuroendoscopic surgery for the treatment of hydrocephalus and other intraventricular pathology in 34 patients over a 2 and a half-year period at our institution.
Patients and methods: 34 patients under neuroendoscopic procedures in the period from August 2009 to March 2012 were treated. The complication rate was determined by recording the hemodynamic variables, temperature, bleeding, time to arouse from anesthesia, serum electrolytes and neurological deterioration in the immediate postoperative period.
Results: We record the intraoperative complications included hemodynamic disturbances such tachycardia, bradycardia and hypertension. Bleeding episodes were major in 1 patient (.34 %) and minor in 3 patients (1.02 %). Hypothermia occurred in 5 patients (1.7 %), delayed awakening in 3 patients and electrolyte imbalance in 3 patients. Postoperatively, 2 patients each had convulsions, 1 patient present transient anisocoria due to 3rd cranial neurapraxia after catheter balloon rupture during dilation of the floor of third ventricle. We report no mortality from observed complications.
Conclusions: Complications during neuroendoscopy surgery may adversely affect the postoperative outcome. Avoiding these complications in relation to the different surgical maneuvers, their prompt recognition by close monitoring and coordinated efforts of the anesthetist and surgeon in treating them can help to decrease the risks associated with this surgical techniques .

0035

Rare complications of vp shunt and lessons

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Introduction: Beside of common complications of VP shunt, there are some relative rare problems (< 5 %) but we can be troubled with them. In our

series, we will present some consecutive cases with intestinal, scrotal penetration; abdominal pseudocyst; choroid plexus adhesion to the ventricular catheter and broken distal catheter into the peritoneal cavity
Methods: We review all documents, images and our strageties in each case. More details of discussion will be systemized and compared with other authors.
Results: We collect 7 documents in over 100 consecutives suffered from hydrocephalus from June 2011 to April 2012 in Children Hospital 2, HCMC, Vietnam. There are 2 cases with viseral penetration (intestine and scrotum); 2 cases with abdominal speudocyst; 2 cases with proximal catheter adhesion and 1 caces with broken distal tube and intraperitoneal dislocation. All of them need to be repaired and replaced by a new one. Intracranial and intra-abdominal endoscopic techniques were also applied usefully for dissecting, removing or implanting the catheter when be necessary.
Conclusion: The rare complications of VP shunt are not until noticed remarkably and sometimes the young neurosurgeons feel embarrassedly. So we want to share our experiences in a "

0042

Comorbid tubercular meningitis and tubercular peritonitis: a diversion nightmare

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Introduction: Tuberculosis is still a killer disease and gaining ground in newer immune compromised territories. In developing countries, it is still a nightmare.
Tubercular Meningitis (TBM) with resultant hydrocephalus remains one of the severest of complications and many a methods of diversions are now available. How common is the co-morbid condition of TBM with hydrocephalus and abdominal peritonitis is still not available, however, it is a frustrating cause of repeated shunt complications and re-surgeries. Overcoming this is an uphill.
Methods: We discuss the management of two cases that were the cause of nearly 50 % of our shunt revision due to the co-morbid association of TBM with hydrocephalus and Tubercular Peritonitis.
We performed the ventriculo-Cholecysto (VC) shunt which diverts CSF from the ventricular system to the Gall Bladder.
Results: The two children are disease free and did not require a revision in the follow up period of three years.
Conclusion: The VC shunt is promising to give good quality of life to children who otherwise had a very morbid period during shunt revisions and the active disease. It is easy to perform and the child could grow to be an adult without requiring any re-surgery.

0049

Endoscopic third ventriculostomy in a 7-days old X-linked hydrocephalic male with aqueductal stenosis and a family study of X-linked hydrocephalus

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Endoscopic third ventriculostomy in a 7-days old X-linked hydrocephalic male with aqueductal stenosis and a family study of X-linked hydrocephalus

Introduction: X-linked hydrocephalus is a rare genetic disorder characterized by hydrocephalus, short flexed thumbs and mental deficiency. Mother is a carrier of a mutation in the cell adhesion molecule L1 (L1CAM).
Methods: Endoscopic third ventriculostomy were performed in a 7-days old male X-linked hydrocephalic child with aqueductal stenosis.
Results: He had severe ventriculomegaly with thin brain mantle less than 10 mm. MR and endoscopic imaging findings included a large massa intermedia, a small brainstem, and diffuse hypoplasia of the cerebral white matter, and the corpus callosum was hypoplastic. After the endoscopic procedure, subdural collection developed, which could be managed conservatively and was most likely attributed to the young age of the child and the assumed poor cerebrospinal fluid absorption ability. But, we demonstrated recovery of head circumference, and effective suckling of our case. In addition, we reported too many family members in which hidrocephalus is inherited in an X linked fashion.
Conclusions: Endoscopic third ventriculostomy is an option for X-linked aqueductal stenosis. However, X-linked hydrocephalus is not a disease of simple ventriculomegaly due to aqueduct stenosis alone but involves other complicated central nervous system anomalies. Therefore, genetic counseling and education of parents is very important in X-linked hydrocephalus.

0053

Complex hydrocephalus in a developing country – decreasing surgical failure rates

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Introduction: The common cases of hydrocephalus encountered in developing countries include postinfective and multiloculated hydrocephalus. Surgical treatment of these is not only technically challenging but also fraught with many complications.
Materials & Methods: We retrospectively analysed 24 cases of multiloculated hydrocephalus treated at our institution for the last 2 years and analyse their presentation, radiology, surgical treatment methods, complications and failure rates.
Results: 16 cases were postmeningitic hydrocephalus (10 tubercular and 5 pyogenic, 1 postsurgical). 8 cases had indolent presentation with laboratory parameters suggestive of subclinical infection. Multiloculated hydrocephalus was seen in 22 cases and 4 had associated cysts. 12 patients had shunt operation (10 unilateral, 2 bilateral), 4 underwent ETV and 8 underwent ETV followed by shunt. Shunt failure rate at 1 year was 67 % while ETV failure rate was 42 %. Innovative treatment methods devised and complications encountered were described.
Conclusions: Successful treatment of multiloculated hydrocephalus not only require clinical suspicion, but also innovative surgical strategies rather than copybook treatment.

0072

Use of grativational shunts in the treatment of pediatric hydrocephalus. A single centre experience

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Introduction: Gravitational shunts are increasingly utilized in the treatment of pediatric hydrocephalus in the last decade. We describe an observation study with a single centre experience.

Material: During August 2008 - March 2012 34 gravitational ventriculoperitoneal shunts were implanted (31 Pedi-GAV and 3 GAV valves, Christophe Miethke GMBH and Co KG, Potsdam, Germany) in 28 hydrocephalic children (9 males). New shunts were 14 of the 34 operations, 7 in the first year of life. Mean age at implantation was 43 months (range: 1.7-172). Mean follow-up was 21 months (range: 2-44). Cause of hydrocephalus was IVH in 11, tumour in 9, meningitis in 2, Dandy Walker syndrome in 2, AVM in 1, aqueduct stenosis in 1, spina bifida in 1, posterior fossa cyst in 1.
Results: Among the 34 implanted valve systems there were 7 obstructions (20.5 %), 1 infection (2.9 %), 1 underdrainage (in a child with previous CSF infection the valve was functioning but the opening pressure of 4 cm H_20 was too high to be tolerated). In 3 patients (8.8 %) the ventricular catheter had to be repositioned in the first few days after surgery due to poor initial surgical placement. There were no episodes of overdrainage (subdurals or slit ventricles).
Discussion: The mid term result of the use of gravitational valves in pediatric hydrocephalus is satisfactory, with a low early complication rate and no significant late side effects. Direct comparison with other valve systems cannot be made in the absence of randomized clinical trial data.

0081

Endoscopic third ventriculostomy in Cuban children under 1 year age. Follow up for 5 years

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Introduction: There is a worldwide discussion in the selection process of which patients under 1 year of each are or not candidate for an endoscopic third ventriculostomy. (ETV)
Method: Twelve hydrocephalic patients under 1 year of each were treated at Juan Manuel Marquez Pediatric Hospital between February 2005 and July 2008.The basic technique was an approach in the external angle of the fontanel with access to the ventricular system follow by a fenestration in the floor of the third ventricle. We repeat the procedure in 4 patients after the first fail.
Results: After 5 years follow up ETV was successful in 5 children (42 %). The fails appear during the first month after the procedure. The repeat procedure was successful in 3 patients. In our study were separate this group of each in 3 subgroups, under 3 months, between 3 and 6 months and over 6 months of age. This technique didn't produce any severe or fatal complication in this group of each.
Conclusions:The success of the ETV in children increased with the age. We recommended to performed this technique in children over 3 months of age. We need to think in repeat the procedure for the stenosis of the stoma in some children. Will be helpful in the future more multicenter studies for established the proper indication in this group of each.

0084

Inverse Reductive Cranioplasty in a Child with Hydrocephalic Macrocephaly and Bilateral Hygromas: a Case Report

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Introduction: Hydrocephalic macrocephaly is often associated with psychomotor retardation and decreased quality of life. Reduction cranioplasty in hydrocephalic macrocephaly remains a largely underdeveloped field of neurosurgery. We present the case of a 7-year-old Northeast African refugee with hydrocephalic macrocephaly with a succession of complications and a previously unreported skull reconstruction technique.
Methods: The patient presents with a hydrocephalic macrocephaly based on congenital aqueductal stenosis. She underwent serial fontanelle punctures prior to receiving a ventriculoperitoneal shunt when she was 2 years of age, just before treatment was taken over by our hospital in the Netherlands. After shunt placement she developed bilateral hygromas. Treatment by evacuation and subduroperitoneal shunt placement was complicated by poor wound healing and frequent infection which required multiple revisions and long term use of antibiotics. At the age of 6, shunts were removed and bilateral craniotomy to evacuate consolidated hygromas with subsequent skull reconstruction by inversion of the bone flaps was performed in two separate procedures.
Results: By replacing the cranial flaps in an inverse manner, the space previously occupied by hygromas was obliterated and a healthy setting for wound healing was ensured. Patient has had no infected hygromas since and hospitalization was significantly reduced. Head movement became less restrained. Psychomotor retardation remained evident but improved subtly.
Conclusion: This case demonstrates a sequence of complications in a child with hydrocephalic macrocephaly and the successful treatment with reductive cranioplasty by inversion of bone flaps to obliterate space previously occupied by hygromas.

0100

Endoscopic third ventriculostomy in the treatment of 76 Hydrocephalic patients. Follow up for 8 years

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Introduction: Traditionally, shunt insertion has been performed when CSF dynamics have been considered abnormal. However, in cases of no communicating hydrocephalus endoscopic III ventriculostomy (ETV) has become a well-established treatment modality. The series of 76 cases of endoscopic third ventriculostomy (ETV) were performed at the Pediatric Neurosurgery Service of the Juan Manuel Marquez Pediatric Hospital in La Havana, Cuba.
Method: We treated 76 children which undergo endoscopic operations for no communicating hydrocephalus, their ages ranged from 19 days up to15 years. The surgical technique was using a precoronal burr hole or the lateral angle of the fontanel in relation with the age. All patients were operated using a rigid Gaab scope with 6.2 mm OD coupled to a Storz light source. Prophylaxis with ceftriaxone was indicated in all cases.
Results: The results are in relation with the etiology and age of the cases. A child under 1 year old has a very high grade of fail. A mortality of 0, 7 % and a morbidity of 5 % were found in this study. Mild hemorrhage, meningitis and CSF leakage were the main complications in relation with the start of the serie. Success was achieved in 72 % cases. Follow-up ranges from 8 years in the first case to 3 years in the last one considered.

Conclusion: Specific results from our study are presented and allow the conclusion that this is an excellent procedure when it is well indicated. Neuroendoscopy has become an alternative to shunts in the treatment of Hydrocephalic pediatric patients.

0101

"Ventricular-gallbladder shunt: an option in the treatment of Hydrocephalus"

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Introduction: In 1958, Smith, Moretz and Pritchard, diverted the cerebrospinal fluid (CSF) into the gallbladder in ten hydrocephalic patients. The Ventricle-gallbladder shunt is a technique described to divert the CSF into the gallbladder when the peritoneum becomes unavailable as the primary receptor site for CSF drainage. This procedure can be performed expeditiously with minimal surgical trauma and blood loss. In selected patients in whom no other side is available, this technique may offer a useful alternative for the insertion of a Ventricular Shunt.
Patient and Methods: We carried out this procedure in twelve patients that were operated of Hydrocephalus in multiple occasions and in whom it was not possible to divert the CSF neither to the peritoneum; Nor the heart cavities.
Results: The twelve patients evolved with minimal complication and in six of them the shunt remains functional and revision free for 5 years. Five patients developed a proximal shunt malfunction after the insertion. Reports of complications with this method principally in the distal end of the VGB shunt; many times the complication is caused by separation of the catheter at the gallbladder wall with subsequent leakage and bile fistula formation. We have not encountered these complications in our series.
Conclusions: Ventriculogallbladder shunting provided an effective site for the CSF drainage. The effectiveness of this treatment is demonstrated, with the good evolution of the patients.

0124

Brainlab optical image guided pre-calibrated catheter placement stylet: Our early experience versus standard stylet registration

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Introduction: Anatomical landmarks are regularly used to guide the placement of ventricular catheters, however, sub-optimal catheter placement is present in up to 63 % of cases. Image guidance is increasingly used in various forms, especially in more challenging cases. We describe our 4-year experience of infrared optical tracking of intracranial catheters in children with challenging intracranial targets, and compare success rates before and after the introduction of a pre-calibrated catheter placement stylet.
Methods: All children in whom Brainlab infrared optical image guidance was used to site catheters were included. Patients were divided into two groups: pre-calibrated catheter placement stylet or those where the standard catheter stylet was registered intra-operatively. Post-operative scans were reviewed and the catheter position scored: 1 - optimal catheter placement; 2 - catheter likely to function but not optimal placement; 3 - catheter unlikely to function due to position.
Results: 27 catheters were placed in 23 patients over the 51-month period: 16 VP shunts (9 primary, 7 revisions), 8 Ommaya reservoir catheters and 3 EVDs. The pre-calibrated insertion tool was used in 18 cases. Before introduction of the pre-calibrated tool there were 3 grade 1 (33 %), 5 grade 2 (56 %), and 1 grade 3 placements (11 %). Using the pre-calibrated tool there were 14 grade 1 (75 %); 3 grade 2 (19 %); and 1 grade 3 placements (6 %). This showed borderline statistical significance (Fisher's Exact $p=0.05$).
Conclusion: The introduction of a pre-calibrated catheter placement tool has increased the accuracy of catheter placement in children with challenging intracranial targets.

0130

Childhood hydrocephalus – is etiology and radiological morphology associated?

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Objective: The aim of this study was to investigate the possibility of categorizing hydrocephalus in different groups purely based on radiological morphology, to attain knowledge on whether these proposed groups relate to the different etiologies and the location of obstructive lesions, and if these possible associations can be of use in clinical practice.
Methods and material: A retrospective cohort study was conducted including 110 hydrocephalus patients below the age of seven seen at Rigshospitalet University Hospital, Copenhagen, Denmark between 2008 and 2011. The neuro-imaging from all patients was analyzed and categorized based on radiological morphology. Patient charts were reviewed and possible association between the underlying cause of hydrocephalus and the proposed groups of radiological morphology was evaluated. Evan's index was calculated for all patients.
Results: Radiological appearance was seen to vary distinctively between the patients. A classification system was created based on the size, shape, and symmetry of the lateral ventricles from axial sections at the level of maximal ventricular width. No statistically significant association was found between the suggested groups of morphology and location and type of pathology.
Conclusion: Distinguishable patterns of radiological morphology exist between patients with hydrocephalus. The proposed classification system cannot in its current form aid in forecasting type and location of the underlying cause of hydrocephalus. A clear need continues to exist for a standardized approach when evaluating etiology and treatment options based on radiological results.

0134

First long-term experiences with adjustable gravitational unit - adjusting at least 12 months after implantation

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Introduction: Overdrainage syndrome in children after shunt surgery is serious problem and unfortunately common underestimated. Prevention of this syndrome isn't easy because of children's dramatic changes of life position during the first two years of life and rapid adolescent growing. Adjustable gravitational unit could be happen to an effective tool for managing of this problem.
Methods: From August 2009 to December 2010 we treated 11 children suffered from hydrocephalus with using adjustable gravitational unit proSA. For nine children it was first shunt implantation - all they were newborns suffered from posthemorrhagic or congenital hydrocephalus. For two, still lying, children it was shunt revision for proximal catheter and another valve obstruction.
Results: During implantation we always adjusted proSA to 16 cm opening pressure for upright position and we completed the system with differential pressure valve miniNAV 5 cm for lying position. When the children started to walk we increased the opening pressure of proSA to 24 cm - in all valves it was possible. We had to solve one system infection and two ventricular catheter obstructions. No symptoms of overdrainage syndrome appeared till this time in all children.
Conclusion: Adjustable gravitational unit seems to be effectual tool against overdrainage syndrome. Maybe for newborns it could be the valve suitable until adult age in ideal conditions.

0140

Neurocognitive development and Emotional, Behavioral problems of children with hydrocephalus and parenting stress of their mothers

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Background: The principal purpose of this study was to assess behavioral, emotional and neurocognitive problems in children with hydrocephalus and parenting stress of their mothers to investigate if specific behavioral, emotional problems and parenting stress are associated with specific medical hydrocephalus-related factors for comprehensive treatment intervention.
Methods: In 11 infants and 9 children with hydrocephalus, Bayley Scales of Infant Development, 2nd Edition, Korean-Wechsler Preschool and Primary Scale of Intelligence (K-WPPSI), Korean Wechsler Intelligence Scale for Children-Third Edition(K-WISC-III), Rey-Kim Memory Test for children, Attention Diagnostic System(ADS), Korea-Child Behavior Checklist(K-CBCL), and Parenting Stress Index (PSI) were used to assess behavioral, emotional and neurocognitive problems.
Results: In infants with hydrocephalus of follow up after shunt, the average level of mental and performance development were mildly delayed. In children the level of intelligence was about average range, verbal in average and performance in low average, also average range in memory quotient but significantly increased in inattention and impulsivity problems. For behavior and emotional problems, in infants general domains were within normal rage but withdrawn and hyperactivity level were slightly increased. And in children, thought, withdrawn, somatic, attention problems were significantly increased. In mothers of infants and children, the level of parenting stress was clinically increased in acceptability of child and competence in parent domain.
Conclusions: The importance of follow up assessment for the developmental curvature and emotional, behavioral problems of infants and children with hydrocephalus was discussed. And the necessity of surgical and comprehensive psychological intervention would be suggested.

0146

Review of ventricle peritoneal shunting (V-P shunting) for hydrocephalus in neonates and infants

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Purpose: Perioperative complications in V-P shunting for neonates and infants occasionally give us difficulties in continuing treatment for hydrocephalus. Results and complications were reviewed in series of our institute.
Methods: Thirty-four neonates and infants underwent V-P shunting for hydrocephalus between January 2003 and December 2011, and were reviewed retrospectively in complications for 6 months postoperatively. Analysis was carried out in the followings; complications by types of device selected in surgery, valve pressure, presence of relaying points in placement of shunt systems, surgeons' double gloving, surgeons' glove change, etc.
Results: Primary diseases that caused hydrocephalus were myelomeningocele (MMC) in 14 cases, intracerebral hemorrhage in 8 cases, aqueductal stenosis in 4 cases, Dandy-Walker syndrome in 1 case, Chiari malformation in 1 case, schizencephaly in 1 case, postmeningitis in 1 case, craniosynostosis in 1 case, X-linked recessive hydrocephalus in 1 case, and unknown cause in 1 case. Three cases out of 34 patients (8.8 %).
Conclusion: Most of shunt infection occurred in MMC. Measures we do now in practice to avoid shunt infection in MMC are shunting as late as possible after repair of MMC, or introduction of CSF reservoir before shunting. Then we have less cases of shunt complication at present.

0147

Endoscopic Third Ventriculostomy (ETV) for Syringomyelia associated with Hydrocephalus

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Background: Although syringomyelia in Chiari I malformation associated with hydrocephalus has been proven to be effectively managed with endoscopic third ventriculostomy(ETV), effect of ETV for syringomyelia in the other disease with hydrocephalus is not clarified.
Methods: We analyzed 39 patients who underwent third ventriculostomy for management of hydrocephalus, and identified four cases with syringomyelia. The etiology of hydrocephalus included Chiari I malformation, Chiari II malformation, post ventriculitis, and posterior fossa arachnoid cyst. Only one patient demonstrated symptom of syringomyelia.
Results: In all patients, hydrocephalus was successfully managed. Also MRI studies revealed the volume of syrinx cavity was reduced in every

case. The stoma was occluded in one case 3 months after the initial procedure. Second ETV for this case was also effective, reducing the volume of the syrinx.
Conclusions: Our results suggest not only syringomyelia with Chiari I and hydrocephalus, but also syringomyelia associated with hydrocephalus of other etiology may be effectively managed by ETV.

0169

Giant abdominal pseudocyst : complication of ventriculoperitoneal shunt - case report and literature review

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Background: Abdominal pseudocyst and ascites as a VP shunt procedure complication are rare, and the overall incidence is less than 1 % among shunted children. The aim of this paper is to report a case of giant abdominal CSF pseudocyst that compromises respiratory function, leading to a life-threatening situation.
Case Report: a three year-old girl with hydrocephalus due to aqueduct stenosis. She was treated with shunt placement at 2 months old. She had signs of shunt obstruction at 7 months old when an endoscopic third ventriculostomy was performed. She remained with hydrocephalus symptoms, therefore a new VP shunt was placed. Since then she had had 3 more shunt revisions, the last one 3 months before she presented at emergency with severe abdominal distension and pain, disorientation and respiratory distress. Abdominal ultrasound showed an abdominal collection with 2000 cc. The patient was submitted to urgent surgery, shunt was externalized and pseudocyst aspirated through distal catheter tip. CSF culture was positive to staphylococcus and antibiotic treatment was instituted. After 30 days a ventriculoatrial shunt was performed.
Conclusion: The abdominal pseudocyst can be very large and life threatening. Treatment consists in fluid drainage ,antibiotics and later shunt repositioning according to abdomen status. Cyst fluid evacuation without laparotomy, may be successful, even in large CSF intraperitoneal pseudocysts.

0174

Ventriculo-atrial shunt (VAS) during long-term follow-up of hydrocephalus

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Introduction: Ventriculo-peritoneal shunt (VPS) is the most common procedure for infantile hydrocephalus. However VAS from VPS is sometimes observed during long term follow-up. We reviewed patients who required VAS and tried to clarify the causes and outcomes of VAS.
Methods: Twenty-five patients requiring VAS in our affiliate hospitals were retrospectively analyzed.
Results: Ventricular shunting was performed in 293 patients. Twenty-five patients (8.5 %) required VAS introduction during follow-up (ranging from 0.25 to 492 months). Primary causes of hydrocephalus of the patients who required VAS were myelomeningocele (MMC) in 12, post-hemorrhagic (PH) in 4, meningitis in 2 and others in 7. Mean age of VAS introduction were 21.8, 16.3 and 11.0 year-old for MMC, PH and meningitis respectively. Mean times of VPS revisions prior to VAS were 3.9, 10.3 and 3.5 for MMC, PH and meningitis respectively. Six patients needed re-VPS from VAS. The reasons of VAS takedown were surrounded sheathe formation of atrial catheter, infection and ventricular dilatation.
Discussion: MMC patients tended to require VAS comparing to other type of hydrocephalus. However, they relatively had less VPS revisions and VAS introduction in older age. This could show that VPS in MMC patients last longer but finally need to be converted to VAS. VAS is revealed to have complications rather than VPS. Actually, six patients had to receive re-VPS due to VAS complications in this study. However, the interval during VAS could provide appropriate rest for the peritoneum and made it possible to perform re-VPS. In this sense, VAS is a good alternative.

0187

Treatment of endocopic third ventriculostomy closure by endoscopic re-ventriculostomy and stenting

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Introduction: Closure of an endoscopic third ventriculostomy (ETV) is a well known complication in the treatment of obstructive hydrocephalus. We present a case in which the complication of ETV closure could by treated successfully by endoscopic re-ventriculostomy (re-ETV) and stenting of the stoma.
Methods: A 9 year old boy presented with obstructive hydrocephalus on routine follow-up MRI scan for neurofibromatosis due to aqueductal compression from neurofibromatosis-associated lesions in the midbrain. An ETV was performed, but failed clinically and radiologically after 20 days. MRI showed at that time no flow void signal at the floor of the third ventricle. A re-ETV was successfully performed. In addition, a long ventricular catheter anchored on a Rickham-reservoir was placed through the stoma serving as a stent.
Results: The patient became asymptomatic immediately following surgery. After 5 months, the patient still is asymptomatic. The MRI shows complete resolution of the hydrocephalus as well as sufficient flow through the stent demonstrated by an obvious flow-void signal on T2-weighted images in the third ventricle and in the pre-pontine cistern adjacent to the catheter. In retrospect a slowly progressive tumor, now showing contrast enhancement at the floor of the third ventricle could be appreciated on the series of images.
Conclusion: This is the first report on implanting a stent during re-ETV in case of an early closure of the stoma. This technique may become a surgical option to prevent and treat closure of the stoma following ETV.

0190

Can endoscopic ventricular irrigation and treatment of obstruction (brain wash) help to avoid complications in the treatment of infantile posthemorrhagic hydrocephalus?

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Introduction: Placement of a sub galeal reservoir with serial aspiration of CSF is a common initial treatment of infantile posthemorrhagic hydrocephalus. Howeverer 80 % of the patients will require a VP shunt as permanent treatment. Loculated hydrocephalus is another challenging problem in the long term management of these patients. We used ventricular irrigation and treatment of obstruction (brain wash) as an adjunctive treatment during reservoir placement in 5 cases of infantile posthemorrhagic hydrocephalus.
Methods: After the endoscope was placed in the ventricular system copious irrigation was used. An endoscopic third ventriculostomy

could be performed in 4 cases. One patient had additional aqueductoplasty, another a pellucidotomy during initial surgery. In one aqueductal stenting only was performed.
Results: Three patients remain shunt free to date with up to 30 months of follow-up. One of these needed a repeat ETV after 14 months. The two other patients needed a VP-shunt. In both an aqueductal stent was necessary. The patient who had an additional aqueductoplasty developed an isolated fourth ventricle after 16 months. Aqueductal stenting was performed then. Up to four additional procedures were necessary in all but one patient. One patient developed postoperative meningitis. No other procedure related morbidity was noticed.
Conclusion: Ventricular irrigation and treatment of obstruction (brain wash) can be used as a supplementary treatment in infantile posthemorrhagic hydrocephalus. Only some patients can be treated with a single procedure but it may reduce the incidence of loculated hydrocephalus and even shunt dependency.

0216

Paediatric Post – Traumatic Hydrocephalus

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Introduction: The reported incidence of post – traumatic hydrocephalus (PTH) varies from 0.7-29 %. It is a treatable complication of head injury, presenting with different clinical syndromes.
Materials and Methods: We present 28 cases of post-traumatic hydrocephalus (CT proven ventriculomegaly with periventricular Iucencies) in the paediatric age group (<20 years) managed in our hospital between July 2008 and February 2012. Clinico-radiology was studied at initial trauma, and at presentation with symptoms suggestive of increased ICP.
Results: Eighty – two percent cases had severe head injury. SDH (53.5 %) and contusions (50 %) were the most common CT findings. Seventy – eight percent cases were managed by decompressive craniectomy at the time of initial injury. Craniotomy site tense bulging flap (50 %) and deterioration in consciousness (39.2 %) were the most common presenting features of PTH, usually after 71±49 days (mean±SD) of initial injury. Medium and low pressure ventriculo-peritoneal shunt was done in 12 cases each and lumbo-peritoneal shunt was done in 4 cases. Shunt revision and infection rates were 32.8 % and 17.8 % respectively. Twenty – two cases (78.5 %) improved, 6 (21.5 %) showed no improvement and 4 (14.2 %) died.
Conclusion: PTH is a treatable complication of head injury with a favorable outcome. Its presentation and prevalence are variable. It should be aggressively sought for as a cause of deterioration and managed by CSF shunting.
Keywords : Head Injury, Complication, Hydrocephalus, Shunt.

0217

Effect of endoscopic lavage for intraventricular hemorrhage in neonates

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Objective: Intraventricular hemorrhage causes significant neurological morbidity in neonates due to direct brain tissue damage and a high rate of malresorbtive hydrocephalus. We investigated the effect of endoscopic lavage (EL) on clinical state and on the need for CSF shunting in this cohort.
Patients and methods: Between 9/2010 and 1/2012 a total of twelve neonates (28.2±15.9 days) with intraventricular hemorrhage were treated with EL. Indication for surgery was significant intraventricular hemorrhage (IVH) with enlargement of the ventricles and increase in head circumference. Between 1 and 3liter of warmed Ringers solution were used during the procedure to clear the supratentorial ventricles. Following EL a Rickham reservoir was inserted to warrant further CSF puncture postoperatively if needed. Clinical stability, complications and need for further CSF diversion were evaluated.
Results: In eight patients one procedure of EL was sufficient for CSF clearance after IVH. 4patients received an additional EL via a contralateral burr-hole. All patients were significantly stabilized in clinical state after EL compared to the preoperative state. No intraoperative or immediate postoperative complications occurred. One infection was observed after 30 days. One patient developed an isolated 4th ventricle warranting aqueductoplasty after 2 months. In the follow up period of 8.7±6.1 months VP shunting was necessary in 8patients (66,7 %). Two patients needed shunt-revisions.
Conclusion: EL is feasible in neonates with IVH under experienced and controlled circumstances. In terms of clinical condition EL did positively affect the postoperative course of all patients and a shunt could be inserted if necessary earlier and with reasonable complication rate.

0231

Hemorrhagic Complications of Ventriculoperitoneal Shunts in Pediatric Patients

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Introduction: Ventriculoperitoneal shunt insertions and revisions for the treatment of hydrocephalus are commonly performed in pediatric patients. We present a single neurosurgeon's series of hemorrhagic complications in these patients.
Methods: All shunt operations in patients ages 18 years and younger were retrospectively reviewed during the period of August 2009 through April 2012. Revisions involving the ventricular only were included. Post operative CT scans were reviewed for hemorrhage related to ventricular catheter placement or revision, and correlated with new neurological deficit or need for early shunt revision.
Results: 47 new and 55 revision operations (102 total) were performed. 3 and 5 hemorrhages were found on CT scans in the new and revision group, respectively. 3 casted ventricles occurred in the new group, and 1 epidural hematoma, 1 casted ventricle and 3 scant hemorrhages along the shunt tract occurred in the revision group. In 2 of the 3 patients in the new group a coagulopathy was discovered in the post operative period. No coagulopathy was present in the revision group. No patient had a new neurological deficit. Early revision due to shunt obstruction occurred in all 3 patients in the new group (1.81 %), and 2 revisions were necessary in the revision group in the epidural hematoma and casted ventricle patients (2.12 %).
Conclusion: The risk of significant hemorrhage causing early failure of a ventriculoperitoneal shunt is low (1.81-2.12 %) and typically occurs in cases where there is a significant amount of blood in the ventricular system.

0258

What should we do with a discontinued shunt?

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Purpose*:* The reported rate is up to 10 % of shunt disconnection or fracture, either ventriculo-peritoneal or subduro-peritoneal. However,

not all of shunt discontinuity is associated with shunt malfunction. We analyzed the discontinuity of the shunt system and related factors and tried to present a follow-up policy.
Methods: This is a retrospective study involving 22 patients who presented with shunt disconnection because of malfunction or other reasons between January 2003 and October 2008. To evaluate shunt function, we performed a shuntogram, temporary ligation, or intraoperative exploration.
Results: Nine (40.9 %) of 22 patients had non-functioning shunts. The shunt system was removed in 8 cases and 1 patient refused surgical management. Of these 22 patients with disconnected shunts, 17 shunts placed in the occipital area were discontinued. The discontinuations were mostly fractured at neck (52 %), not disconnected at connection site.
Conclusion: Shunt disconnection has not been always represented a shunt malfunction. We thought many patients with disconnected shunt may be independent from shunt system and it can be a good chance for patient to remove the shunt system

0269

Suprasellar arachnoid cyst presenting in a premature neonate with complete resolution following endoscopic fenestration; a case report

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Suprasellar arachnoid cyst presenting in a premature neonate with complete resolution following endoscopic fenestration; a case report

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Introduction: An ex-premature male neonate was referred at 40 weeks (corrected) with a 4 week history of vomiting, weight loss, bulbar symptoms and an orbito-frontal circumference (OFC) increase from 50th to 99.6th centile. Sunsetting was present, but no bradycardias or apnoeas were evident. MRI head revealed a 33×34 mm suprasellar cyst elevating the IIIrd ventricle causing significant depression of the pons and midbrain and a resultant hydrocephalus.
Methods: Access to the left lateral ventricle was gained by an endoscopic approach. The cyst was visible from both foraminae of Monro, and a fenestration procedure was performed to good effect.
Results: Post-operatively, sunsetting and bulbar symptoms improved, with a rapid return to oral feeding. Repeat MRI 6 weeks later showed complete resolution of the cyst, with flow void confirming a patent third ventriculostomy. Over 6 months, the patient has continued to measure OFCs between the 91st and 98th centile, is showing signs of improving development (though delayed compared to average) and has no evidence of recurrence on MR imaging.
Conclusion: Suprasellar arachnoid cysts are an important cause of hydrocephalus in neonates, especially in the context of lower cranial nerve impairment. Endoscopic fenestration is a safe and effective treatment that, in certain circumstances, can lead to complete macroscopic resolution.

0279

Alternative methods for hydrocephalus monitoring in IVH infants

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Intraventricular hemorrhage (IVH) frequently occurs (12-20 %) among preterm infants born prior to 35 weeks gestation. While some IVH cases will result in favourable outcomes, others progress to hydrocephalus. However, the imprecision of current techniques used to detect changes in post-hemorrhagic ventriculomegaly can delay treatment, causing secondary deficits.
Currently, in most institutions, neonates at risk are monitored clinically with head circumference measurements (HC) and conventional 2D ultrasound (US) for hemorrhage and potential ventricular dilation. The sensitivity of Evan's ratio derived from 2D US, is poor because it cannot accurately measure irregular ventricular volumes and doesn't reflect the true volumetric change. We also know that HC doesn't reflect truly ventricular changes in volume.
We are investigating whether 3D US in conjunction with Near Infrared Spectroscopy (NIRS) are viable bedside tools that would improve the decision tree. Our hypotheses are that 3D US will be more sensitive to volumetric changes, and clinically significant changes will lead to reductions in cerebral blood flow, prior to changes in HC or fontanelle softness. Initial findings from our first patients have shown that manually segmented 3DUS images provides accurate volumetric measure, and enables us to detect minimal changes that would not have been detected with the Evan's ration. We will however need more patients to see whether those changes will make a difference in the decision to treat

0282

Bizarre presentations of "Creeping" shunts and the role of plain radiographs

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Introduction: We report 3 bizarre presentation of a distal shunt malfunction secondary to creeping nature of the distal end of ventriculoperitoneal shunt.
Case 1: A 5-year- old presented to us with signs of suggestive of shunt malfunction. The plain radiographs done as a workup for possible shunt malfunction demonstrated the distal shunt tip reentering the abdominal wall from inside the peritoneal cavity.
Case 2 and 3: Two children presented with scrotal migration of shunt and bizarre non- specific complaints
We discuss the possible explanation for the phenomenon and avoidance of morbidities due to them.
Conclusion: We conclude that these cases are just reminders of the fact that shunt malfunctions can have multiple presentations. A regular follow-up with appropriate imaging and high index of suspicion is mandatory in preventing morbidities due to the creeping nature of the shunts.

0303

Childhood Hydrocephalus; Transition of Care to Adult Service - Patient's Perspective & Clinical Outcome

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Introduction: Transition of care from pediatric to adult services is challenging for pediatric neurosurgeons as well as for patients and their families. We assessed clinical outcome and satisfaction of transitioning process in pediatric hydrpcephalus at Alder Hey Children's Hospital.

Methods: Transitioning of services is a structured program at our center. Total of 30 patients were seen at transition clinic in last two years. Clinical outcome of these patients after VP shunt insertion was assessed retrospectively and a feedback taken to evaluate the satisfaction of these patients and their families.
Results: Out of 30 patients 14 were male and 16 females. Median age at time of first shunt insertion was 1 year (range 1 month - 17 years). Hydrocephalus was due to hemorrhage of prematurity in 7, post meningitis in 6, Congenital in 5, Spinal dysraphism in 4, Chiari malformation in 4 and Post operative in 4. The overall incidence of Shunt failure was 60 %. Shunt malfunction was due to proximal catheter in 44 %, distal catheter in 17 %, Shunt fracture in 16 %, and Valve malfunction in 11 % patients. 96 % of transferred patients and their families were satisfied with transition process. About 3 % of transitioned patients complained of difficulty in getting appointment.
Conclusion: Long term shunt survival is low in adult transition patients with pediatric onset hydrocephalus. Majority of families are satisfied with transition to adult practice, provided this is done in organized fashion.

0304

Neocortical Capillary Pulsatility and Endothelial Cytopathology in Experimental Adult Communicating Hydrocephalus

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In communicating hydrocephalus (CH), hemorrhage or meningitis within the basal cisterns may cause decreased subarachnoid compliance, which in turn may increase capillary pulsatility. Shear forces accompanying increased microvascular pulsatility may have pathological effects on endothelial cell function, which could help explain some of the neurological impairments associated with CH. In this study, we measured capillary flow velocity and pulsatility in the parietal cortex of adult CH rats using in vivo two-photon microscopy and evaluated endothelial cell changes in the same tissue using immunocytochemistry. CH was induced by kaolin injection into the basal cisterns (n=8); controls received saline injections (n=2); animals survived 5-7 days. Data collected on 353 capillaries demonstrated a significant ($p<0.05$) increase in pulsatility index (PI) in hydrocephalic animals anesthetized with isoflurane. Unbiased stereological light microscopy of the same cortical region that provided PI data demonstrated a trend toward increased density of cells expressing endothelial barrier antigen (EBA), rat endothelial cell antigen-1(RECA-1), and permeability glycoprotein, suggesting that compression caused compaction of cortical capillaries. The EBA:RECA-1 ratio showed a trend toward a decrease from controls, which, when correlated with PI, suggests that during CH neocortical capillaries with increased pulsatility also exhibit alterations in endothelial cell barrier function. Furthermore, when compared to our previously published findings (JCBFM 32:318-329, 2012), these results show that the choice of anesthetic can influence measurements of capillary pulsatility. Most importantly, this study suggests that changes in subarachnoid compliance can increase capillary pulsatility and possibly impair endothelial cell function.

6. Epilepsy/Functional – Poster

Postoperative Seizure Outcome in Children with Supratentorial Tumors

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Introduction: Many reports have focussed on seizure outcome in children with gangliogliomas and DNETs. Less data exist concerning seizure outcome in children presenting with supratentorial tumors of other histology.
Methods: Under an IRB approved protocol, we performed an institutional retrospective chart review of 39 patients with non-ganglioglioma/ non-DNET supratentorial tumors presenting with seizures treated with surgical resection between 1990 and 2011. We analysed seizure outcome across the following variables: preoperative duration of seizures, seizure types, seizure frequency, preoperative duration of seizures, seizure type, seizure frequency, preoperative antiepileptic drug requirements, tumor location, tumor histology, patient age and extent of resection.
Results: Thirty-nine patients met the above criteria. Mean age at time of resection was 119 months (range: 5-233). Mean preoperative seizure duration was 22 months (0-192). Seventeen (44 percent) had temporal lesions. Twenty three (59 percent) had generalized seizures. Twenty seven (69 percent) underwent gross total resection. Twenty eight patients (76 percent) were seizure free at last follow-up (mean follow-up 36 months) or had only isolated seizures in the immediate post-operative period. In this dataset, preoperative seizure duration of equal to or less thanone month was the only factor predictive of post-operative seizure control ($p=0.0071$).
Conclusions: While pre-operative seizure duration was predictive of seizure outcome, extent of resection, type of preoperative seizure, tumor histology, location of lesion and age of operation had no significant association with seizure control.

0021

Clinical features of lesional temporal lobe epilepsy in patients of early childhood

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Introduction: Temporal lobe epilepsy (TLE) is the most common epilepsy syndrome in both adults and adolescents. The aim of the study is to evaluate the clinical features of lesional TLE in patients of early childhood.
Methods: Five pediatric patients with lesional TLE were admitted to our hospital. They all had their first attack before the age of 2 years. The semiology, EEG changes, images were presented. Anterior temporal lobectomy(ATL) was performed in all patients.
Results: The ictal semiology of these patients was different from that of adult patients. No aura was reported. Typical symptoms in adult TLE including oroalimentary and manual automatisms were uncommon. Motor arrest was the usual initial symptom. Other motor symptoms including spasms, clonic seizures were common. The EEG findings were often more extensive than the size of the lesion. During the follow up after ATL, all patients were seizure free. Their mental development was much improved after surgery.

Conclusions: Clinical features of lesional TLE in patients of early childhood were quite different from those in adults. Early surgical intervention is highly recommended.

0067

Selective corpus callosotomy using intraoperative interhemispheric subdural grid monitoring

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Purpose: Corpus callosotomy is a palliative surgical procedure to control intractable seizure. However, disconnection syndromes, or split-brain syndrome are most problematic complications after corpus callosotomy, especially children over 10 years old. Therefore, we report two cases of selective callosotomy under intraoperative interhemispheric subdural grid monitoring using diffusion tense imaging magnetic resonance navigation.
Methods: Two cases of 11 and 9 year old female patients underwent for selective callosotomy under navigation guidance with diffusion tensor imaging techniques with motor fiber tracking. Both had intractable seizures involving both hemispheres in preoperative workups. Interhemispheric subdural grid was used and selective callosotomy was carried out under navigation guidance to prevent disconnection syndrome.
Results: For 11 year old female patients, after callosotomy from the genu to posteriorly 3 cm, bilateral generalized synchrony was disappeared and she is free of generalized type seizure with medications. For 9 year old female, selective callosotomy upto the motor fibers was performed and her traumatic falling disappeared without any disconnection syndrome.
Conclusion: Selective corpus callosotomy is effective for seizure control of bilateral generalized synchrony without disconnection syndrome. Selective callosotomy can be considered especially for patients over 10 years old with thorough preoperative monitoring.

0096

Outcomes of disconnective surgery in intractable pediatric hemispheric and sub-hemispheric epilepsy

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Objectives: To study the seizure outcome of disconnective epilepsy surgery for intractable hemispheric and sub-hemispheric pediatric epilepsy.
Methods: 34 children (age<18 years) who underwent a peri-insular hemispherotomy (PIH) or a peri-insular posterior quadrantectomy (PIPQ) from April 2000 to March 2011 were included in the study. All patients underwent a detailed pre surgical evaluation. Seizure outcome was assessed by the Engel's classification and cognitive skills by appropriate measures of intelligence that were repeated annually. We recorded 11 variables and analyzed them to arrive at predictive variables of a complete seizure freedom.
Results: The mean age was 7.9 years. There were 22 (64.7 %) males and 12 (35.3 %) females. Epilepsy was due to Rasmussen's encephalitis (RE; n=11), Infantile hemiplegia seizure syndrome (IHSS; n=12), Hemimegalencephaly (HM; n=3), Sturge Weber syndrome (SWS; n=4) and due to post encephalitic sequelae (PES; n=4). Twenty seven (79.4 %) patients underwent PIH and seven (20.6 %) underwent PIPQ. The mean follow up was 30.5 months. At the last follow up, 31 (91.1 %) were seizure free. The age of seizure onset and etiology of the disease causing epilepsy were predictors of a Class I seizure outcome. A younger age of seizure onset pointed to poor seizure outcome following surgery. Patients with HM had the worst seizure outcome.
Conclusions: We document an excellent seizure outcome following disconnective epilepsy surgery for intractable hemispheric and subhemispheric pediatric epilepsy. An older age of seizure onset, RE, SWS and PES were good predictors of a Class I seizure outcome.

0123

Hemostasis issues during peri-insular hemispherotomy for hemimegalencephaly: the report of 2 cases

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Introduction: Techniques for hemispherotomies have improved over the last two decades. Nonetheless with hemimegalencephaly, it remains a delicate surgery and intraoperative bleeding can be difficult to control. We describe here two cases where surgery had to be either interrupted for the first case while the second developed a huge post-operative hematoma, which needed prompt surgical evacuation.
Methods: The first case is a 3 months old girl suffering intractable seizures from a right hemimegalencephaly. The right peri-insular hemispherotomy was interrupted due to significant bleeding after 2/3 of the disconnection. Remaining connection in the anterior part of the corpus callosum was disconnected a month later. Due to persistant epilepsy, a right frontal lobectomy was performed two months later.
The second case is a 13 months old boy with intractable epilepsy from a left sided hemimegalencephal. During the left peri-insular hemispherotomy, persistant venous bleeding was difficult to control. After surgery, the patient was extubated but on the following evening he was found comatous with fixed dilated pupils. A huge post-operative hematoma was found on the CT scan and emergency evacuation was performed with special care for hemostasis.
Results: The first case was seizure free after last surgery. The second patient was extubated the next day after hematoma removal and no clinical seizures have been recorded since.
Discussion: Although good results after hemispherotomies are well known, these cases highlight the complexity of the surgery in particular when venous bleeding can be extremely difficult to control despite normal clotting profil.

0125

Cerebellar gangliocytoma presenting with intractable epilepsy: a case report

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Introduction: Epilepsy of cerebellar origin is very rare and presents frequent pharmacoresistant seizures. We describe here the case of a right cerebellar gangliocytoma associated with intractable epilepsy and its clinical manifestations.

Methods: This is the case of a 14 months old girl presenting with epilepsy since birth and development delay. Symptoms included tachypnea and left hemifacial spasm. A right nodular cerebellar lesion, hyperintense in T2 and FLAIR sequences without contrast enhancement was seen on the MRI, involving the superior and medial portion of the right cerebellar lobe, extending towards the right peduncle. Despite appropriate antiepiletic treatment, which reduced the frequency of seizures, at least 30 to 40 epileptic episodes were observed per day. Electric source imaging, ictal SPECT and interictal FDG-PET were all concordant with a right cerebellar epileptic focus. A suboccipital craniotomy and removal of the lesion was performed under electrophysiological monitoring, and cerebellar electrocorticography, including implantation of depth electrodes in the lesion.
Results: The lesion was firm and of abnormal consistency under ultrasonic aspiration. Histopathological analysis was compatible with a gangliocytoma. Since surgery the patient is seizure free.
Discussion: The association of epilepsy and cerebellar lesion is very rare. Interestingly from the only few cases reported in the literature the presenting symptoms are usually stereotyped, including hemifacial spasms which was also a presenting symptom in this patient. Early surgical excision is indicated in these cases to prevent the debilitating consequences of pharmacoresistant epilepsy, which affects the neurodevelopment of these children.

0153

Vagal nerve stimulation for intractable epilepsy in children: the Queensland experience

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Introduction: Vagal nerve stimulation is a well established, but poorly understood adjunctive means of treating epilepsy shown to be refractory to medical treatment. Since 1999, over 50 children in Queensland have had a vagal nerve stimulator (VNS) placed and we report upon the results of our experience of 46 patients with a minimum period of 12 months follow up.
Methods: All consecutive paediatric cases of VNS insertion, since 1999, were reviewed by examination of case notes, discussion with the treating neurologist and telephone questionnaire to the parent(s).
Results: There were 21 male and 25 female patients. The mean age at implantation was 10 yrs 6 months, with the youngest 3 yrs and 9 months.
In concordance with other published series, 25 patients (54 %) had a reduction in seizure frequency of >50 %. Nine patients had a reduction by <50 % and 12 patients (26 %) experienced no change. One patient became seizure free.
The majority of parents reported beneficial effects upon mood and cognition in their child (31 patients, 67 %) and expressed a wish for replacement of the VNS battery when required (34 patients, 74 %). Complications were generally minor, however two systems did require revision and then developed infection.
Conclusion: Placement of a VNS in a child with intractable epilepsy is a well tolerated and effective method of significantly improving seizure control, with acceptable morbidity. Not only does the VNS reduce seizure frequency and severity by >50 % in approximately half of the patients, it also improves mood and cognition in the majority.

0275

Intra-operative MRI Guided Paediatric Epilepsy Surgery - The Alder Hey Experience

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Introduction: paediatric epilepsy surgery is a challenging task. Various strategies have been advocated to make surgery safe and successful. These include awake craniotomy, intra-operative cortical mapping and neuronavigation. However, very little has been published on the use of intra-operative MRI (iMRI) for epilepsy surgery.
Methods: we have reviewed prospectively collected data relating to paediatric epilepsy surgery carried out at our institute using our intra-operative MRI scanner.
Results: 38 procedures were carried out for medically intractable epilepsy in the last 3 years. iMRI was performed in 22 procedures (20 patients). Average age at surgery was 8 years (range 2-17 years). The cause of the epilepsy was cortical dysplasia (CD) in 4, CD and mesial temporal sclerosis in 2, neuronal heterotopia in 1, tumour in 5, tuberous sclerosis in 4, hypothalamic hamartoma in 2 hemimegalencephaly in 1 and multiple cavernoma in 1 patient. Range of surgery included: cortical resection following grid insertion, lesionectomy, lobectomy and hemispherectomy. Only 2 complications were observed relating to wound infection. There was no mortality in this series. Outcomes represented using the Engel classification were as follows: 70 % Engel class I, 30 % class II and 10 % class III control.
Conclusion: iMRI is a valuable addition to the neurosurgical armamentarium for epilepsy surgery especially in lesional cases. The majority of our cases had gross total resections of epileptic foci and showed satisfactory seizure control post operatively.

0126

Short-term outcomes after selective dorsal rhizotomy in children with GMFCS level IV-V

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Background: Selective dorsal rhizotomy (SDR) is a well accepted neurosurgical procedure performed for the relief of spasticity in children with spastic cerebral palsy.
The aims of this study were to evaluate short-term functional outcomes, safety and side effects in children undergoing SDR with GMFCS level IV-V.
Methods: This study group consisted of 16 children, consecutively operated, with spastic quadriplegia. Mean age was 5.8 years (range 3.5-8.1). They were all assessed by the multidisciplinary team at pre- and at 6 months, postoperatively. Clinical and demographic data, complications and number of rootlets cut were prospectively registered. Deep tendon reflexes and muscle tone were examined, the latter graded with the Ashworth scale. Motor function was classified according to the GMFCS and measured with GMFM-66. Parent's opinions about the children's performance of skills and activities and the amount of caregiver assistance were measured with Pediatric Evaluation Disability Inventory (PEDI).

Results: The mean proportion of rootlets cut in S1-L2 was 65 %. Muscle tone was immediately reduced in adductors, hamstrings and dorsiflexors ($p<0.001$) with no recurrence of spasticity over the 6 months. The PEDI results showed statistically significant improvement ($p<0.001$) in the dimensions functional skills and caregiver assistance for the domains self-care and mobility.
Conclusion: SDR is a safe and effective method for reducing spasticity permanently without major negative side effects. In combination with physiotherapy, in a group of young children with spastic quadriplegia with GMFCS level IV-V, it provides promising functional outcomes postoperatively.

0193
Minimal Invasive Selective Dorsal RhizotomyFirst European Series
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Background: After 100 years, selective dorsal rhizotomy (SDR) was reintroduced in Germany in 2007. Since then, 100 children were submitted to surgery, performed by a single pediatric neurosurgeon.
Material: The indication for surgery was based on the proven diagnosis of icp, gait laboratorry analysis, an interview with the parents and a detailed neurological examination. Surgery was performed in a modified technique based on the concept of TS Park followed by a novel technique of single level laminoplasty. One week after surgery the patients were transferred to a rehabilitation center or discharched. Follow up was performed by the same team excluding the neurosurgeon after 6 months, one year and two years.
Results: 4 patients wer lost to follow up after surgery. Results were available to this day after 6 months in 92 patients, after 12 months in 72 patients and after 24 months in 24 patients.The average improvement (GMF) was significant with 4.1-4.3 points. No patient deteriorated after surgery, there was no related morbiditiy or mortalitiy. Additional orthopedic interventions prior to or after SDR were planned and performed in 16 patients.
Potop x-rays for hip status were available in 40 children. All of them showed a satisfying fusion of the reinserted lamina.
All patients improved regarding gait or overall performance. A functional improvement of the upper limbs was reported by 8 patients.
Conclusion: Modified minimal invasive selective dorsal rhizotomy is a safe and effective procedure. Modified laminoplasty may further diminish the risk of spinal instability.

7. Oncology – Poster

0267
Manuka Honey: Sweetness or sweet-healing of infected neurosurgery wounds?
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Introduction: Honey is an ancient remedy and its ability to rapidly clear infection, promote wound healing is due to high-levels of hydrogen peroxide production by glucose-oxidase enough to kill micro-organisms but leaves skin undamaged. Antibacterial activity varies in potency. Some honeys are no more antibacterial than sugar, others remain effective at >100-fold dilutions. "Active manuka honey"(with UMF) is produced from Leptospermum plants.
Aims & Objectives: Manuka Honey dressing was investigated in the treatment of infected neurosurgical wounds. Honey treatment of cranio-cervical and lumbosacral wound infections following surgery for myelomeningocele repair and posterior fossa expansion is presented.
Patients & Methods: A term baby underwent repair of a lumbosacral myelomeningocele and untethering of spinal cord on day 2. A purulent discharge developed threatening dehiscence despite antibiotics. A 10 ½year old underwent posterior fossa expansion for complex craniosynostosis. Post-operatively she developed a wound infection and mild dehiscence. Manuka-Honey dressings were applied to the non-healing wounds once daily, for 7 days.
Results: Exudation of fluid reduced significantly following the honey dressings. In both cases, excellent healing and wound cover were noted. Sequential images were taken of the wounds during the very rapid healing, demonstrating healing without significant scarring and smooth skin surfaces.
Discussion: Reduction of the wound exudates suggests an anti-inflammatory action of honey. The amount of honey required on the wound and its frequency of changes are discussed.
Conclusion: Initial experience with use of Manuka Honey has been very positive. A controlled study in neurosurgical wound healing using Manuka Honey is planned.

0011
Cribriform neuroepithelial tumor(CRINET), a rare nonrhabdoid ventricular embryonal tumor: case report
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Purpose: Cribriform neuroepithelial tumor (CRINET) has been rarely reported. The authors represent a fourth case of world-reported ventricular CRINET and analyze characteristics of the unknown embryonal tumor with previously reported cases
Material and result: A 10-month-old boy presented with progressive ataxia for 2 weeks. Brain MR imaing revealed heterogenously enhancing, 55 mm sized mass lesion on the third ventriculo-pineal region and ventriculomegaly owing to obstruction of ventricular system by the mass. He received total resection via anterior transcallosal approach. His specimen showed relatively small undifferentiated tumor cells arranged in cribriform strands. The tumor expressed positive response to several histopathologic stain. Contrary to general embryonal tumors, there presented no definite of rhabdoid tumor cells. The patient showed gradual recovery of his ataxia. He was transferred to pediatric department for preparing adjuvant chemotherapy, after post operation management was completed. On review of previously reported cases, 3 CRINET patients showed that tumors were located within ventricular region(one in third ventricle, two in fourth ventricle). And they had discriminative histopathologic characteristics like loss of INI1 protein expression and presencce of rhabdoid cells. They all had good responsiveness to chemotherapy and clinical improvements.
Conclusion: Atypical teratoid/rhabdoid tumors(AT/RTs) generally have poor prgonosis like other CNS malignancy. CRINET is a ventricular tumor that shows loss of tumoral INI1 protein , but without rhabdoid tumor cells. We suggest that CRINET has relatively favorable prognosis and it can gives us expectation for successful treatment of newly reported embryonal tumor.

0022
The Incidence of Facial nerve Palsy in the treatment of posterior fossa pediatric tumors
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Introduction: The study examines factors related to the incidence of postoperative facial weakness in children with posterior fossa tumors.
Methods: The dataset examined medical records for children diagnosed with infratentorial tumors between 1991 and 2011 treated at a single institution. Records of 199 patients found to be eligible were retrospectively analysed under an IRB approved protocol.
Results: 88 pateints were female. Average age at surgery was 7 years (range: 6 months to 19.6 years). 99 were diagnosed with pilocytic astrocytomas, 67 with medulloblastomas, 23 with ependymomas and 10 with anaplastic ependymomas. Thirteen cases (6.5 percent) presented with facial weakness preoperatively, and 40 cases (20.1 percent) had a new postoperative facial weakness. Data showed that gender, preoperative symptom duration, histology, extent of resection, chemo or radiation therapy had no significant prognostic value for postoperaive facial weakness. There was a statistically significant relationship between craniotomy for recurrent disease and facial weakness. 24 of the 157 patients (15.3 percent) with only an initial surgery had postoperative facial weakness as opposed to 16 of the 42 (38.1 percent) who underwent surgery for recurrent tumor.
Conclusion: Analysis showed a statistically significant association between operation for tumor recurrence and new onset facial weakness.

0025

Stereotactic biopsies of brain lesions in children using the frameless Medtronic Stealth Passive Biopsy Needle kit

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Introduction: When there is need to biopsy a deep seated brain lesion in a child, traditionally a fixed frame system has been used, with all the limitations that this may impose. The development of the Medtronic frameless stereotactic passive biopsy needle kit provided the opportunity to avoid the steps relating to frame placement and scanning under general anaesthesia.
Material: We used the Medtronic frameless stereotactic passive biopsy needle kit in 4 children during 2010-2012. Average age was 7.5 years (4.5-12 years). They all had non-excisable lesions (3 thalamic tumours, 1 recurrent pineal tumour with cyst). Planning MR scan was performed the day before surgery. Target and trajectory selection was done using the Medtronic Stealth software. During operation the head was fixed in the Mayfield system.
Results: In all children the biopsy system was employed successfully. It was possible to attach the screws of the securing plastic base on the skull securely. In all operations the needle remained stable throughout the procedure and the preselected trajectories were upheld. Satisfactory diagnostic specimens were received from the selected areas, with no complications.
Conclusion: The use of the Medtronic frameless stereotactic biopsy needle kit proved easy and successful in children old enough to have their heads secured with pins. It eliminated the need for frame placement and MR acquisition with the frame on under general anaesthesia. The system is useful in large lesions, where even minor deviation from the preselected trajectory and target are not going to influence the final result.

0033

Pediatric malignant tumors of posterior third ventricular region (ptvr): focus on complication avoidance

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Objective: Steps to avoid complications while managing pediatric malignant PTVR tumors are discussed.
Methods: Fourteen children (age:4-18 years;mean:12.43 years; presentation range:7 days-2.5 years) with malignant TPTVR underwent clinico-radiological assessment and surgery. Resection was deemed partial when some tumour mass remained, near total when<10 % was retained over vital neurovascular structures, and total when complete resection was attained. Fractionated radiotherapy(4500-5500 cGy) was administered to malignant pineal, germ cell and glial tumours. Spinal radiotherapy(3000-3500 cGy) was given in pinealoblastomas or on detection of spinal metastasis. Malignant nongerminomatous germ cell tumours(NGGCTs), disseminated pineal cell tumours, and very young children received combination chemotherapy including cisplatin, vinblastine, bleomycin.
Results: Tumor pathology included pinealoblastoma(n=4;one with pineaocytic differentiation), nongerminomatous germ cell tumor(NGGCT;n=3), germinoma(n=3), and primitive neuroectodermal tumor(PNET), fibrillary astrocytoma, glioblastoma and malignant teratoma(n=1, respectively). Surgery included infratentorial supracerebellar;occipitotranstentorial; frontal parasagittal interhemispheric transcallosal subchoroidal; transcortical transventricular; fronto-temporo-zygomatic combined transylvian-subtemporal approaches; endoscopic biopsy and third ventriculostomy; or, ventriculoperitoneal shunt with stereotactic biopsy.Total excision was performed in 6, near total in 4, partial in 2, only biopsy and radio-chemotherapy in 2 patients. Patients with germinomas and low-grade astrocytomas had >5 year; malignant teratoma, an intermediate grade; while pinealoblastomas, NGGCT, PNETs and glioblastomas had a low tumor-free interval. Three patients had failure of CSF diversion; one, an intraoperative haematoma.
Conclusion: Minimally invasive techniques often considerably improve outcomes. Variability in venous pressure during positioning may precipiate operative haematoma. Unusual lobar recurrences may be due to gravity-dependent tumor seedling and to shielding of polar region during radiotherapy. Long-term neuropsychological consequences of adjuvant therapy in pediatric patients are emphasized.

0041

Lateral ventricle tumors in children: how to avoid surgical complications ?

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Introduction: Tumors of the lateral ventricle are common in children and often present surgical difficulties related to their deep location, large size, the risk of bleeding and of hydrocephalus.
Methods: From our retrospective series of 45 children treated in our hospital since 1995 (mean age: 8 years, from 1 d to 18 y), we reviewed the complications related to surgery.
Results: The diagnosis was often made in a context of intracranial hypertension (29/45) because of a large tumor volume requiring emergency care. Raised ICP was frequently the only symptom, easily overlooked in young children. The risk of bleeding dominated surgical complications and the help of an experienced anesthetic team and a fast neurosurgeon were indispensable. Initial surgical control of the vascular pedicles must be a parameter for the selection of operative approach especially for choroid plexus papillomas. Preoperative hydrocephalus will often be treated by the upfront tumor resection . Postoperatively, the risk of subdural collection is important especially in small children and may require temporary drainage. The surgical

approach must be guided by respect for the pyramidal tracts, the Papez circuit and visual pathways, with the help of a tractography if possible. Visual field defects were found in 7 cases on 45. Oncological prognosis is often good because tumors were predominantly low-grade (28/45). However, the developmental outcome of the patients is often poor (adapted schooling in 13 cases on 45) because of sever intracranial hypertension and young age at diagnosis.
Conclusion: Most of the surgical complications could be reduced by a precise preoperative planning and a management by a multidisciplinary team.

0046

Surgical approach for thalamic tumors

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Introduction: Thalamic tumors are relatively rare tumors growing in a highly functional part of brain. They are more frequent in pediatric population. Their surgery is challenging and a high morbidity is possible. Relatively benign nature of many of these tumors means that an attempt for radical resection should frequently be peformed. The approach has to be very carefully planned, sometimes with the help of modern diagnostic methods like DTI. The location and projection of the tumor in the thalamus playes an important role in choosing the approach.
Material: We have studied a group of 10 pediatric patients with thalamic tumors treated from 2005 - 2012. There were 8 males and 2 females, age ranged from 1 - 18 years (mean 11 years). Transcortical approach was used 4×, transcallosal 3×, transsylvian 2× and supracerebellar infratentorial 1×.
Results: Gross total resection was achieved in 4 cases, subtotal in 3 and partial in 3. There were 7 pilocytic astrocytomas, one subependymal giant cell astrocytoma, one diffuse astrocytoma G II and one glioblastoma. All patiens are still alive with the mean follow-up 4 years. There was no permanent morbidity in this group.
Conclusion: Thalamic tumors might be safely radically resected if correct approach is used. The choise of approach is based on the projection of the tumor. Smaller tumors which are not close to the thalamic surface might be followed or biopsied if there is a likelyhood of its malignit nature. Oncological treatment should be reserved for malignit tumors.

0056

Stereotactic intracavitary therapy with bleomycin in pediatric recurrence cystic craniopharyngiomas

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Introduction: Craniopharyngiomas present some of the foremost challenges in Neurosurgery. Treatment remains controversial, including intracystic chemotherapy with Bleomycin. The objective of this study was investigate the antitumor effect of Bleomycin on Paediatric patients.
Patients and Method: Between February 2003 and February 2009, 15 patients harbouring recurrence cystic Craniopharyngiomas were selected. All met the following criteria:
1.) Diagnosed as Craniopharyngioma according to pathology or cytological data.
2.) Lesions Mainly Cystic.
3.) Patients and their families agreed to receive this experimental treatment.
The treatment protocol consists in silicone tube inserted stereotactically into the cystic and connected with a Reservoir. The dose of Bleomycin started 1 week after the insertion with 9 mg (3 ml).This solution was injected through the reservoir 2 times per week for 4 week of therapy, until a total dose of 72 mg.
Results: The cystic almost or completely disappeared in 14 patients. Just after the therapy all patients had improved vision. Twelve patients had no severe complication or sequelae and were able to return to school. All patients decrease 80 percent of the volume of the cyst during the first 6 months after finish the treatment. The most frequent complications were fever and headache. After 5 years follow up six patients need a second cycle of treatment with Bleomicine.
Conclusion: The Bleomycin is effective inhibiting the growth of the Cystic craniopharyngiomas when it is used as Intracavitary chemotherapy. The mechanism of bleomycin on craniopharyngiomas and its toxic effect on the brain need to be further studied.

0057

Moyamoya Syndrome after Radiation Therapy for Malignant Germ Cell Ttumor and Sponateous EDAMS after Tumor Removal- Case Report

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Adjunctive radiation therapy of childhood intracranial neoplasms has rate complication of vasculopathy. I report one case of moyamoya syndrome in a ten-year-old boy with malignant mixed germ cell tumor on the suprasellar area who underwent two times of surgical resection and followed gamma knife radiosurgery and proton beam radiation therapy for growing teratoma syndrome. He was stable serum and CSF marker with adjunctive chemotherapy. One year after proton therapy, suddern right hemiparesis and motor dysphasia developed. MR revelaed slightly high SI at left frontal lobe white matter near left lateral ventricle frontal horn and narrowing at left distal ICA, ICA bifurcation, and bilateral A1. Two years later, he has another episode of TIA after general anesthesia for tonsilectomy. Cerebral angiography revealed multifocal narrowing at right supraclinoid ICA and diffuse and marked narrowing at left MCA M1 portion and left EDAMS state with collateral flow to left frontal lobe through STA without any direct of indirect bypass surgery. I report this very case and long term surveillance image is necessary.

0059

Brain tumors in infants of Ukraine: an epidemiological study

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Introduction: We present an epidemiological survey of brain tumors in infants with regard to their age-related location, histology, malignancy and analyzed in periods before and after Chernobyl accident.

Methods: Between 1980 and 2009, 541 infants with brain tumors and less 3 years were treated at the Pediatric Department of the Institute of Neurosurgery. Those patients represent 10.2 % of the tumor of childhood seen in this unit.
Results: The pre-Chernobyl material (1980-1984) numbered 37 cases, whereas in the post-Chernobyl periods it became more sizable: 1985-1989 - 75 cases (2 times increase); 1990-1994 - 111 cases (3 times increase); 1995-1999 - 88 cases (2.4 times increase); 2000-2004 - 88 cases (2.4 times increase); 2005-2009 - 143 (3.9 times increase). Taking into consideration the overall decline of birth (on 42.2 %) and natural decrease of general children's population, the 3.9 times growth of a mean incidence value seems rather substantial. The lesions were verified in 433 (79.9 %) cases.
In order of frequency the most common types were astrocytic tumors (39.9 %), embryonal tumors (21.9 %), ependymal tumors (14.1 %) and choroid plexus tumors (9.9 %). The post-Chernobyl period saw the rise of malignant tumor incidence (III-IV grade anaplasia). In 1980-1984 they constituted 44.4 % and in 2005-2009 came up to 50.8 %.
Conclusions: Analysis of brain tumor incidence in infants before and after the Chernobyl disaster has clearly demonstrated its rise. Malignant tumors accounted for 45.5 % of all neoplasms.

0060

Management of medulloblastoma in children: a single-institution long-term retrospective report

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Introduction: A retrospective study of 361 cases of medulloblastoma in pediatric patients treated at our institution.
Methods: Between 1990 and 2011, 361 children with medulloblastoma were treated at the Institute of Neurosurgery. This presented 10.8 % of all pediatric brain tumors diagnosed during this time period. 247 were males and 114 females. The patients were grouped by age as follows: 0-3 years, 61; 4-7 years, 136; 8-12 years, 124; and 13-18 years, 40.
Results: 98 % patients underwent removal of tumor. Complete tumor resection was achieved in 36.8 % of the children, and subtotal resection represent in 52 % cases, partial in 9.4 % and only biopsy was performed in 1.7 % cases. A ventriculo-peritoneal shunt was required in 25.5 % of the children. Chang's classification was used to grade the tumor: T1 6 cases (1.7 %), T2 60 cases (16.6 %), T3a 147 cases (40.7 %), T3b 127 cases (32.1 %), T4 21 cases (5.8 %), M0 319 cases (88.4 %), M1 12 cases (3.3 %), M2 23 cases (6.4 %) and M3 7 cases (1.9 %). The main localization was the median line: vermis and 4^{th} ventricle in 86.7 % cases. 83,3 % patients underwent craniospinal radiation. 40 % children had chemotherapy. Follow-up data from 1 month to 10 years is available for 74.7 % patients. The median survival was 18 months and 2- and 5-year survival were 42 % and 6 %, respectively. The recurrent rate was 80 (34.3 %).
Conclusions: The outcome for patients with medulloblastoma has been correlation with extend of surgical resection, total removal increased survival time. Long-term survival is possible in children treated for medulloblastoma.

0071

Infantile intracranial aggressive fibromatosis———two cases and review

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Aggressive fibromatosis (AF) is nonmetastasizing fibroblastic proliferative lesion that is histologically benign, but AF is characterized by infiltrative growth and frequent recurrences. To our knowledge, intracranial involvement in infants is rarely reported. At present, the recognition and treatment strategies for infantile intracranial AF are unclear because of its rarity and limited literatures. In China, there is few clinical literatures about infantile intracranial AF. We describe two cases of infantile intracranial AF, through reviewing relevant literatures, and get a better understanding on pathological features, differential diagnosis and treatment of this condition.

0076

Factors Predisposing to permanent CSF diversion following posterior fossa tumour resection in a Paediatric Population: Role of dural closure

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Objective: The management of hydrocephalus following posterior fossa tumour resection in paediatric patients continues to be an area of debate. While a minority of patient will require post resection cerebrospinal fluid (CSF) diversion, the majority do not, which has made pre-emptive CSF diversion in all patients difficult to justify. This study aims to delineate factors that predispose patients to post-operative CSF diversion.
Methods: This study retrospectively reviews 40 children treated for posterior fossa tumours at the Women's and Children's Hospital in Adelaide, South Australia between January 2006 and December 2010. The median age was 9 years (0.4-15 years). Seventeen patients were diagnosed with medulloblastoma/PNET, 13 with pilocytic astrocytoma, 5 with ependymoma, 2 with dermoids and 3 with other types of tumours. Results were analysed with unpaired t–test for continuous variables and chi square, two tailed Fischer exact tests for categorical data.
Results: Overall, 9 of 39 patients (23 %) patients required CSF diversion (7 shunts and 2 ETV). There was a significant association between the type of dural closure (watertight versus loose) and the presence of a post-operative pseudomeningocele or wound leak and the need for CSF diversion. An association between the size of the tumour and the requirement for CSF diversion was also noted.
Conclusion: Our results indicate that the type of dural closure is associated with the formation of pseudomeningoceles and wound leaks as well as the requirement for CSF diversion. This data highlights the importance of obtaining a watertight closure, particularly in large posterior fossa tumours.

0092

Identification of differentially expressed genes in ependymomas according to location, histological grade and patient age

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Ependymomas are rare glial cell-derived tumors. They can be found in every central nervous system location and despite the histological similarity, they seem to display distinct genomic abnormalities. The role of prognostic factors such as histological grade, age, tumor location and extend of resection are controversial. Postoperative radiotherapy has not a clear impact on the outcome and there is no standard chemotherapy protocols. We aimed to study the expression levels of selected genes in ependymomas and correlate with clinical data and histological features.

Third-three samples of ependymomas were analyzed by quantitative real time PCR for expresssion of the following genes selected based on SAGE database and literature: CCND1, CHST5, DNALI1, MSX1, NOTCH1, ARMC3, RSPH4A, GNA13, IGF2, FGFRL1.

Nineteen patients are under 18-year-old. Ten cases are located in supratentorial, 13 cases in infratentorial and 10 cases in spinal cord. One adult case has a spinal myxopapillary tumor, 79 % are grade II and 18 % are grade III. The following genes presented a higher expression in intramedullary ependymoas: ARMC3, RSHL3, CHST5, DNALI1 ($p<0.05$). CCND1 and IGF2 ($p<0.001$), FGFRLI1 and NOTCH1 ($p<0.05$) are more expressed in grade III than grade II and I. DNALI1 was the only gene with a higher expression in adults than in infantile cases. None of the genes impacted in PFS or OS of patients.

Ependymomas have different gene expression according to location and grade in our data. We will follow an immunohistochemistry study in a series of 110 patients try to identify other clinical relevant factors.

0094

Management dilemnas and outcome prognosticators in congenital infantile brain tumors : a single centre series of 38 cases

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Objective: Infantile brain tumors are uncommon entites, often challenging to treat surgically; differing from adult tumors in histology, tumor location, and overall prognosis.

Methods: Retrospective clinical data for patients treated for intracranial mass lesion at single centre. Observations: 38 infants operated for brain tumors (Jan 2002- Dec 2011) , mean age : 8.2 months (28 males, 10 females). Most common mode of presentation was bulging fonanelle or hydrocephalus. Majority had gross total tumor resections and were monitored in neurointensive unit. Supratentorial location was noted in 19 cases (multilobar hemispheric in 5, intraventricular 3, frontal 2, temporal 2, thalamic in 4 cases) and infratentorial in 19 cases(cerebellar in 16, 2 brain stem, 1 fourth ventricular). Final pathology was pilocytic astrocytoma (12 cases), anaplastic astrocytoma (2), atypical rhabdoid tumors (3), desmoplastic infantile ganglioglioma (2), medulloblastomas (7), PNETs in 2 cases). Mean MIB labelling index was 18 (in 16 cases available data), 17/38 tumors were high grade tumors (gr III-IV WHO).

Conclusions: Brain tumors in children younger than 12 months of age present with a variety of tumor pathologies. Small babies have risk of intraoperative massive blood loss owing to low blood volume, hypothermia and are surgical challenging requiring intensive postoperative support. Over 40 % of infantile tumors are high grade lesions and are associated with poor prognosis. More studies are necessary to understand the impact that different treatment options, tumor pathology, and tumor location have on neurological outcome.

0098

Complications of the treatment in 60 patients with Craniopharingioma. Cuban experience

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Introduction: Craniopharingiomas are a challenger for neurosurgeons all around the world.

These tumors began with endocrinology symptoms, motor deficits or intracranial hypertension. There are several types of treatments but the tumors residuals are very commons and need hormonal substitutive treatment.

Method: We treated 60 children which undergo different types of treatment for Craniopharingioma. Their ages ranged from 2 up to17 years. We approach this patient with 3 different surgical techniques:

First group: 35 patients was operated using a craniotomy.

Second group: 17 patients underwent a reservoir with instillation of Bleomicine

Third group: 8 children were treated for neuroendoscopical techniques.

The follow up period was 8 years. The clinical records, surgical protocols, radiologic studies, operative videos and follow up were reviewed.

Results: The complications were different in relation with the type of treatment:

First group, craniotomy approach show a 34 % of mortality and residual or regrow tumor in 87 % of cases with very poor prognosis and worse motor deficit in 25 %. Hydrocephalus 30 % was a very frequently complication in this group. Other complications were serositis and pancreatitis. The second group more common complications were fiver 65 % and headache 40 % .The third group of patients treated by endoscopy present fiver in 85 % and neumoencephalus in 25 %.

Conclusion: Total receptions in lesion more than 2 cm is difficult and produce several complications and high mortality. In our study there is a predominance of large tumors with best results with less aggressive treatment like endoscopy or use of Bleomicine reservoir.

0104

Synchronous Two Different Pathologies in a Pediatric Patient.Case Report and literature ReviewAli Aljuzair,MD, Ayman Albanyan, MD, FRCSc

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Abstract: Having a malignant brain tumor in 3 year old baby is something bad. But

Getting two malignant brain tumors in the same time is smoothing unimaginably sad.

The authors here reporting a rare case, first in the literature (up to their knowledge). Of a 3 year and 9 month old baby presented with frequent vomiting for two months which found to have huge lateral ventricular heterogeneously enhanced lesion, big enough to obstruct the CSF flow and causing hydrocephalus which was totally resected and tended to be a choroid plexus carcinoma. 1 year and 8 months later, following courses of chemotherapy. Patient was found to have another left periventricular,

heterogeneously enhanced lesion which thought to be initially a recurrent. Unfortunately, found to be different pathology, Anaplastic astrocytoma. The authors reviewed the literature for multiple brain tumors with different histological characteristics in a single individual patient

0106

Combined Use of Intraoperative MRI (iMRI) and Intraoperative Neurophysiology Monitoring (IOM) in Resection of Focal and Exophytic Brainstem Gliomas

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Introduction: Focal and Exophytic Brainstem gliomas are rare tumors that are challenging in terms of surgical management. They are usually benign in nature and operable, but complete resection is not always possible. The authors' believe that these goals are best achieved by the use of (iMRI) with (IOM).
Methods: A retrospective database reviewed of all focal and exophytic brainstem gliomas presenting to NNI, who underwent surgical resection using iMRI with IOM, from September 2007 to December 2010. Median follow-up was 15.5 months. The following Variables: Degree of tumor resection, Functional outcome, neurological complications and Survival all were studied, analyzed and compared to the available data in the literature.
Results: The authors' found 11 cases of focal and exophytic brainstem gliomas with mean age of 8.4 (1-17 years). Of these, gross total resection was achieved in 6 cases (54 %) while the rest were subtotal. Functional outcome immediately post op showed 2 (18 %) improved 3 (27 %) deteriorated, while the remaining showed no changes. Median follow up of 15.5 months showed 6 (55 %) improved, 5(35 %) deteriorated, 3 of them died. The median of estimated blood loss was 350 ml (50-800 ml)
Conclusion: iMRI + IOM are safe and useful combination to minimize the neurological complications caused by surgery for focal and exophytic brainstem glioma, and maximize the degree of resection of these tumors.

0113

Brainstem gliomas-a precise scoring based surgical outcome: an experience from North Indian tertiary care centre

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Introduction: Brainstem tumors represent approximately 1.5 % of all intracranial neoplasm. They make up about 10-20%of CNS tumors in children. It has been thought that surgery has a very limited role in brainstem glioma. In this study we evaluate our experiences for the modes of clinical presentation, radiographic characteristics, surgical approaches used and to access early (6 week) surgical outcome based on a precise clinical grading system the Kumar and Samir Score.
Methods: 42 operated patients of histopathologically proven brainstem glioma(mean age 12.8 years; range 4 months to 38 years;male/female ratio=28:14) ,were included in the study. Preoperative, postoperative and follow up neurological assessment was done using K&S score. We have a follow up ranging from 2-74 months. Follow up at 6 week was taken to evaluate benefit provided primarily by surgery, following which patients were subjected to radiotherapy.
Results: Focal lesion was the most common variety. Pilocytic astrocytoma was the most common histopathological type. K&SS decreased in 3 patients, was equal in 7 patients and showed improvement in 32 patients. The mean K&SS from pretreatment level of 84.80±10.4 increased to 88.7±9.2, at 6 weeks follow up.
Conclusions: Brainstem gliomas have varied modes of presentation depending on their location. The tumors amenable for surgery are usually low grade and present with slow progressive features at a slightly higher age. MRI appearance and growth of tumor needs to be correlated with clinical presentation before deciding upon the treatment plan as surgery is beneficial in focal, exophytic and cervicomedullary lesions

0117

Managing high grade gliomas in pediatric age

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Introduction: High grade gliomas of the pediatric age have distinctive features from their adult counterparts. When clinically feasible, aggressive tumor resection with adjuvant therapy may provide a longer progression free survival. However, attempt at gross total resection of deep seated lesions, such as in thalamus almost invariably will complicate to functional sacrifice. In this study we aimed to address our management approaches to high grade gliomas at different localizations, from a perspective of complication avoidance.
Material and methods: We performed a retrospective analysis of 38 patients, with high grade gliomas, either primary or secondary. Medical records of patients were analyzed, who were operated for a high grade glioma between 1996 and 2010.
Results: Male to female ratio was 20/18. Thalamus was a predominant site for tumor localization. In 14 patients, tumor was localized to deep structures (thalamus, hypothalamus, pons, medulla oblangata etc.). Hemispheric lesions were excised extensively when away from an eloquent brain region. Whereas only open, endoscopic or frameless stereotactic biopsy was performed in thalamic and other near-eloquent tumors. In 2 of 10 patients, in whom tumor was localized to thalamus, biopsy was complicated with progression of hemiparesis and postoperative coma respectively. Resection of a hemispheric lesion was complicated with progression of hemiparesis in 5 patients.
Conclusion: Although gross total resection of high grade gliomas, followed with adjuvan radiotherapy and chemotherapy offers a prolonged survival free interval, extensive surgery may be associated with worsening of preoperative symptoms. An optimum treatment, therefore, must be decided on an individual basis.

0119

A primary orbital sarcoma with neuronal differentiated detected in fetal period

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Background: Primary congenital orbital tumor is a rare entity with few cases reported in the literature. Herein, we report a case of a fetal orbital mass detected with antenatal fetal ultrasound screening.

Case report: By routine use of antenatal ultrasound screening, a pre-born baby with left orbital mass detected to 33 weeks of gestation was referred to our institution. The MRI confirmed the diagnosis and showed no other anomaly such as hydrocephalus and macrocephaly. At 36 weeks, pregnancy was interrupted by rapid progression of his ocular proptosis by caesarean section. The postnatal MRI revealed that the tumor extended to his cranial middle fossa and posterior fossa.
To stabilize his systemic condition and diagnose the tumor histopathologically, left orbital exentration was carried out at his 9th days of life. The quick diagnosis of the tumor was neuroblastoma. However, from some aspects of molecular assessments, the final diagnosis of this tumor was amended to non-specified sarcoma with neuronal differentiation. Multi pathological consultations are in progress.
Conclusion: Further study is needed to identify the character of this tumor especially in molecular biology. It would be necessary to select aggressive interventions to treat primitive brain tumors because of their rapid growth and poor prognosis.

0121

Peri-operative complications of posterior fossa tumour surgery, a single institution experience

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Introduction: A retrospective review of resective surgery of posterior fossa tumours at our institution over a 4-year period (January 2008 - November 2011).
Methods: Documentation of all patients who underwent primary operations for posterior fossa tumours (excluding vestibular schwannoma) was reviewed. Data was collected on histology, extent of surgical resection, complications and the need for pre and post-operative CSF diversion.
Results: 42 patients were identified (24 male and 18 female). Ages ranged from 17 months - 16.75 years (median 7.2 years). There was no peri-operative mortality. Histologically there were 19 pilocytic astrocytomas (45 %), 15 medulloblastomas (36 %), 7 ependymomas (17 %) and 1 atypical teratoid rhabdoid tumour (2 %). In 27 operations (64 %) complete resection was achieved, and near-total resection in a further 14 (33 %). 5 patients (12 %) developed cerebellar mutism, of which four were histologically medulloblastoma (27 % of medulloblastomas) and one was ependymoma (14 % of ependymomas). All patients with mutism had midline tumours with brainstem compression on MRI pre-operatively. 11 patients (27 %) developed worsening ataxia following surgery. 7 patients (17 %) developed new cranial nerve palsies. 9 operations (21 %) were complicated by CSF leak, of which 2 underwent preoperative endoscopic third ventriculostomy. 2 patients suffered from tongue swelling requiring tracheostomy.
Conclusions: Posterior fossa tumour surgery in children can be carried out safely with complete or near total resection in most cases with acceptable morbidity. Cerebellar mutism was associated with medulloblastomas, metastases at presentation and midline tumours with brainstem compression. Preoperative ETV did not prevent post-operative CSF leak.

0138

One-year experience in efforts to establish and bank tumor cell lines for every patient that undergoes a tumor resection

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Introduction: A tumor cell line is an in-vitro culture of cancer cells with the capacity to perpetually re-divide. Tumor cell lines are a valuable tool in the study of cancer cell biology and the advent of novel therapies to treat cancer. In this study we establish a protocol to rapidly create and store tumor cell lines from patients who undergo tumor resections at our institute.
Materials and methods: Specimens are obtained at the time of resection, immediately placed in EMEM, separated using the cross-scalpel method, treated with collagenase type 2 (6 mg/ml), 20 % FBS, 1 % penicillin/streptomycin, and 0.002 % DNase I in MEM-alpha, then filtered through a 40 μm cell strainer to obtain a single cell suspension. Next, cells are cultured in EMEM, 20 % FBS, 1 % non-essential amino acids, and 1 % sodium pyruvate in a humidified atmosphere of 5 % CO2 at 37 °C. The medium is changed two times weekly. When cells reach confluency, they are dispersed and replated at a split ratio of 1:2.
Results: In one year we have operated on 26 pediatric patients for resection of brain or spinal cord tumors. 18 of these patients were enrolled in our study. We have successfully established 14 tumor cells lines from 14 different patients.
Conclusion: Our experience suggests that it is feasible to establish tumor cell lines in some patients who undergo tumor resection. We are currently examining the nature of these cell lines and their clinical utility for the patients from which they are derived.

0151

Pitfalls in the treatment of paediatric skull base chordoma

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Chordomas are rare tumours arising from the embryonic notochord. Treatment is challenging due to their deep location, local infiltrative nature and involvement of surrounding bone. In the paediatric population there are additional challenges involving the developing skull and brain. Complete surgical resection is not achieved in the majority of cases due to anatomic constraints, therefore adjuvant radiotherapy is commonly utilised. Individual experience with these tumours is often limited because of their rarity. We hope to alert clinicians involved in the management of paediatric chordomas to the obstacles and potential complications that can arise as a result of the treatment as well as the disease progression.
The patient was diagnosed at the age of 12 months and survived until she was 5 years old. The management strategy consists of surgical resection and proton beam radiotherapy. This child developed numerous complications including cranial nerve palsies which occur commonly and are associated with tumour infiltration as well as extent of resection. She also had multiple cerebral infarcts from an internal carotid artery stenosis associated with proton beam radiation therapy, which is widely recognised in conventional photon irradiation but so far has not been reported in photon beam irradiation therapy in the paediatric population.
Paediatric skull base chordomas are challenging tumours to treat for a multitude of factors. The treatment should be administered with great care and the patients require close follow up to allow for early detection and management of the numerous complications than can arise which are potentially treatable.

0160

Intracranial Meningiomas in children (2-17 years) PGIMER experience of 10 years (2002-2012)

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Background: Intracranial meningiomas are uncommon benign tumours in children which account for 0.4-4.6 % of all intracranial tumors in children.
Object: To retrospectively analyze epidemiological profile, clinical features and radiological findings, type of excision, Histopathological findings and over all management profile of these patients.
Patients and Methods: This is a retrospective analysis of 08 patients with meningioma diagnosed at PGIMER, Chandigarh between 2002-2012March . Clinical evaluation, treatment, and outcome of these patients are recorded and presented.
Results: Mean age was 6.9 years (range 2-17 years). There were 7 boys and one girl (gender ratio was7:1). Most common presenting symptoms were headache and seizures. There were no co- morbid illnesses. Surgical resection was done in all patients. The histological picture was transitional meningioma in two malignant meningioma in one. One patient received chemotherapy. Long-term sequelae include seizures, diabetes insipidus, blindness, neuropsychologic abnormalities, and multiple surgical procedures. Two patients are self dependent.
Conclusion: This study tries to defines the incidence clinical presentationof children with meningioma in northwest of India, the roles of surgery, radiation, and chemotherapy and long term results. Relevant literature will be reviewed.

0161

Prognosis of pediatric high-grade gliomas with temozolomide treatment: A retrospective, multicenter study

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Purpose: We analyzed the usefulness of initial or recurrent treatment of temozolomide (TMZ) in pediatric high-grade gliomas (HGGs).
Methods: Between 2002 and 2010, we performed surgery on 35 patients with 17 glioblastomas, 14 anaplastic astrocytomas, 3 anaplastic oligodendrogliomas, and 1 anaplastic oligoastrocytoma. The male-to-female ratio was 21:14 and the median age was 13 years (range, 3-18 years). The mean follow-up period was 15.9 (± 1.8) months. As the TMZ treatment, 22 patients received the initial treatment and 13 patients at recurrence. We analyzed the prognostic significance of TMZ treatment.
Results: The median progression-free survival (PFS) and overall survival (OS) were 9.7 (± 1.4) and 17.8 (± 2.5) months, respectively. Based on univariate analysis, the median PFS was 9.9 (± 1.6) months in the tumors located in the cerebral hemisphere and 5.6 (± 1.3) months in the diencephalon ($p=0.03$). Median PFS was 12.5 (± 1.7) months in initial treatment and 6.8 (± 0.8) months in recurrent treatment ($p=0.03$). The median OS was 14.9 (± 2.3) months in glioblastomas and 24.4 (± 4.1) months in tumors with an anaplastic pathology ($p=0.01$). The median OS was 12.1 (± 3.7) months in patients with CSF dissemination and 18.2 (± 2.9) months in patients without CSF dissemination ($p=0.02$). Grade 3 and 4 treatment related toxicity occurred in 7.7-9 %.
Conclusions: Initial or recurrent TMZ treatment in pediatric HGGs was safe and tolerable. Initial treatment showed improved PFS compared to recurrent treatment and both showed the similar OS.
Key words: chemotherapy, high-grade glioma, initial, pediatric, recurrent, temozolomide

0170

Intraventricular diffuse astrocytoma in full-term infant with intraventricular hemorrhage – case report

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The intraventricular diffuse astrocytoma (WHO grade II) in an infant is very rare brain tumor about which few reports have been published. We present the clinical course in an infant with intraventricular hemorrhage detected incidentally by ultrasonography at birth. A 3.9 kg boy was delivered vaginally at full-term, his head circumference was 36.5 cm, and the anterior fontanel exhibited a slight bulge. MRI performed after birth revealed huge intraventricular hemorrhage occupying the right-side whole ventricle. We inserted the EVD catheter at right ventricle due to ventriculomegaly. After 3 months later, we detected the multiple mass at the right ventricle, especially frontal horn in follow-up MRI. The tumors were subtotally resected by endoscopic-assisted craniotomy; pathological diagnosis was diffuse astrocytoma (WHO grade II). Immunohistochemical staining was positive for GFAP, vimentin, s-100 protein and negative for EGFR. There was no MGMT methylation. He underwent postoperative chemotherapy and is alive well 6 months after surgery.

0173

Disputable Issues for Pediatric Hypothalamo-pituitary Tumors in Japan - From long-term follow up results

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Objects: We analyzed long-term follow-up results of patients having hypothalamo-pituitary tumors treated in pediatric age considering what is necessary for follow-up systems in Japan.
Clinical materials and methods: Thirteen patients, 6 males and 7 females, were included in this study. Those hypothalamo-pituitary tumors were treated when the patients were under 15 years old and the follow-up periods were longer than 10 years (mean:20.4±5.8 years). We evaluated the present condition of the patients, follow-up department, and medical treatment.
Results: Treatment for the tumor itself is not continued in any patients. Eight need hormonal treatment. Twelve have reduced visual acuity. Twelve were independent in activity of daily living. Nine were able to work. The other 4 need some assistance because of mental retardation and/or inappropriate hormonal therapy. Only 2 got married. One dropped out from follow-up of neurosurgical department. Four patients were followed-up by pediatric doctors.
Discussion and Conclusions:Patients treated hypothalamo-pituitary tumors in their childhood can be independent socially, though they are handicapped. Appropriate hormonal treatment is necessary for their

independency. Longer follow-up period in pediatric department, more difficult for the patients to leave pediatric department. When the patients' conditions were stable for many years, they pay less attention to the tumor recurrence and their medical history. To evaluate very long-term results of the patients treated for hypothalamo-pituitary tumors, a network system to share patients' information among related departments and for education to the patients and their family should be established to prevent dropout from neurosurgical follow-up.

0182

Atypical teratoid/rhabdoid tumour. Our experience with 10 peadiatric cases

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Atypical teratoid/rhabdoid tumours (AT/RT) are rare neoplasms with unfavourable prognosis. We report 10 paediatric cases, and their treatment results.
Material and methods: Seven girls and 3 boys, between 4 months and 8 year-old, have been treated from 2005 until December 2010. In eight cases the localisation was intracranial, in one case at the craniospinal junction and in one case in the lumbar area with extra dural extension down to L3. Cranial localisation was temporal for two patients, parietal for two others. intraventricular for one, pineal for one other and at the pontocerebellar angle for the last one. Every patient had a surgery associated with a complementary treatment. All patients have been followed with a cranio-spinal MRI. Every patient had benefited of a chemotherapy and radiotherapy was done for patients older than 3. The patient with the craniospinal localisation has been operated on twice by transoral approach. After chemotherapy he received a proton therapy.
Results: Five patients are alive and 5 have died. The mean period of survival of the patients who died was from 5 to 8 months. The mean follow up period of the patients alive is 33.2 months. Poor prognostic factors were the young age and the incomplete removal.
Conclusion: AT/RT are very malignant tumors and their diagnosis must lead to a complete removal in order to have better survival results or even complete remission.

0191

Life threatening macroglossia following posterior fossa surgery

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Introduction: Life threatening magroglossia is a rare complication of posterior fossa surgery. The majority of cases have been reported in adults and we found only 3 case reports in children. The aetiology is unknown but may be due to arterio-venous insufficiency or be neurogenic in nature. We describe 2 patients who developed severe macroglossia following posterior fossa surgery. Both cases occurred within a 2-week period and no episodes have occurred before or since.
Methods: The patient's case notes, clinical photography and imaging were retrospectively reviewed.
Results: Both patients were females aged 3 years, 10 months. One underwent surgery for recurrent ependymoma and one for pilocytic astrocytoma. The prone position with oral endotracheal intubation and 3-pin head fixation was used for a standard midline approach in both cases. Operative times were 5 and 9 hours respectively. One patient had previously undergone similar surgery without complication. Both patients required urgent re-intubation post operatively due to severe macroglossia causing airway obstruction. Surgical tracheostomy and maxillo-facial involvement to minimise tissue damage were required. Imaging of the venous system did not demonstrate evidence of venous obstruction. Tongue swelling persisted for several weeks but both children went on to make a good recovery and had no long term neurological deficits. Once child underwent redo surgery under the same operative conditions four months later without complication.
Conclusions: Severe magroglossia is a rare complication of posterior fossa surgery. The aetiology is unknown but the consequences can be life threatening. Surgical teams must remain vigilant during the peri-operative period.

0192

Surgical treatment of ependymoma in children. Our experience from 2000 to 2010

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We operated on 29 children. The localization of the lesion was in the posterior cerebral fossa (PfEp) in 20 cases (69 %), supratentorial (StEp) in 6 (21 %) and spinal (SpEp) in 3 (10 %). The age ranged between 2 months and 16 year-old. For the PfEp, intracranial hypertension was found in 14 patients, 5 had a stiff neck and 4 balance troubles. For the StEp, 3 patients had headaches and 2 had visual troubles. Two patients with SpEp suffered of back pain. All the children underwent a surgical procedure. Histopathology showed a predominance of OMS grade II for the PfEp and grade III for the StEp. There were only OMS grade 1 and 2 for the SpEp. In 8 cases, ventriculocysternostomy was performed before the resection in the PfEp group. A complete removal was performed except in 2 cases (1 StEp et 1 PfEp). Six patients had post-operative chemotherapy and 13 radiotherapy.
Results: Twenty six patients survived with a mean follow up of 3.5 years (6 months to 10 years). Three patients dead (2 PfEp and 1 StEp). Four children had a post-operative facial palsy, 3 had swallowing problems and 4 a cerebellar syndrome. Fiveteen have a normal schooling.
Conclusion: This series confirms that ependymoma is an aggressive tumor especially in the posterior cerebral fossa location. Despite advances in molecular studies with highlight of different genes expression between the various locations of ependymomas no evident therapeutic target emerged yet. Therefore, surgery with complete removal remains the most important prognostic factor even if there is a greater risk for post-operative deficit.

0196

A comparison of trends in symptom interval for Low Grade Gliomas, Ependymomas, PNETs, Craniopharyngiomas and Rare tumour types in the North West region of England between the years 1954-2008

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Introduction: Co-incidental with the launch of the 'Head Smart' campaign in the UK, we have benchmarked the presenting symptom interval to diagnosis for childhood brain tumours in the North West of England for a 55 year time period.
Methods: The case notes and NW Children's Cancer Registry records of patients diagnosed with the above tumour types between years 1954-2008 in the North West Region of England were investigated.
Results: For children with LGG (n=554) the availability of the CT and then MRI scan was associated with a reduction in the symptom interval to diagnosis from approximately 10 months before 1975 (CT introduced), to a steady 5 months in the more modern treatment eras. In comparison, the time to diagnosis for ependymoma (n=129) has remained steady at 1.7 - 2.4 months for the study period, and approximately 55 % of children with PNET (n=220) have been diagnosed within 6 weeks of first symptom since the mid 1960's. However, there has been a significant increase in the number of patients presenting within 6 weeks the craniopharyngioma (n=82) and rare tumour groups (n=251), particularly choroid plexus tumours in the CT/MRI scan eras.
Conclusion: Advances in neuro-imaging have been associated with reductions in the median time to diagnosis from first symptom for some, but not all brain tumours of childhood. The challenge to reduce the median time to diagnosis <6 weeks needs to be met for all tumour types in the NW of England.

0205

Disease control for Pediatric Craniopharyngioma: Does the surgical approach impact outcomes?

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Objective: Pediatric craniopharyngioma has traditionally been treated using a transcranial approach however, there's growing acceptance of transsphenoidal resection (TSR). While a TSR for small craniopharyngiomas can reduce morbidity, it remains to be demonstrated whether this is an appropriate management strategy for giant tumors. Our study aims to report outcomes in consecutive pediatric patients with craniopharyngioma treated via TSR with the goal of defining a risk-based treatment algorithm.
Methods: Thirty-one pediatric patients with pathologically consistent craniopharyngiomas were operated on at UVA (1993-2011). Medical records and imaging studies were retrospectively reviewed. Tumors were stratified based on degree of hypothalamic involvement. Disease control and clinical outcomes were analyzed.
Results: Among 31 patients in the study, 16 had pre and post-operative imaging for review. Five patients had tumors with no hypothalamic involvement; of these 4 had GTR without disease recurrence; one had a fenestration and has stable disease. All have anterior pituitary dysfuction. Five patients had tumors displacing the hypothalamus but without involvement; all underwent GTR. Three have anterior pituitary dysfunction, the remaining are intact. Six patients had tumors with hypothalamic involvement; of these 2 had a GTR and remain disease free; 2 underwent near total resections with stable disease; 2 underwent subtotal resections with stable disease. All have panhypopituitarism.
Conclusions: The transsphenoidal approach for pediatric craniopharyngiomas is an efficacious operative strategy with a high rate of GTR and low risk of recurrence. The cost is overwhelming panhypopituitarism. The transsphenoidal approach should be considered in pediatric patients with craniopharyngioma, including those with large tumors.

0212

Targeted Therapy for Supratentorial Hemispheric glioma A 10 years experience

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Introduction: Recurrent high grade gliomas still remain a formidable challenge, for Neurosurgeons, Radiotherapist and Neuro-oncologists. Large number of newer molecules have been tried, in the last 2 decades, without any significant break through.
Material & Methods: Over last 10 years, 3 different studies carried out at our Institute, using targeted therapy for recurrent glioma. All 3 were Multinational and Multicentric study. One study 2003-2006, we enrolled 17 patients, in second study 2006-2010, we enrolled 15/55 patients and in 3rd study 2011-2012 we enrolled 1/30 patients. In all antibody were targeted through microcatheter placement and drug was delivered by CED. In two studies Anthesense compound, "a oligonucleotide" was injected for 22 weeks (11 cycles) each cycle 2 weeks. In the 3rd study monoclonal antibody tagged to I^{131} was inject intratumorally in 15 patients of recurrent GBM.
Result: In two studies with Antisense compound AP12009, we observed suggestion of good results in recurrent grade III astrocytoma, no significant result in GBM, as compared to controlled. The study with I^{131} monoclonal antibody was also suggestive of improved survival.
Conclusion: Targeted therapy in recurrent high grade glioma are under trial and likely to make difference in next decade.

0221

Postoperative Complications in Posterior Fossa Tumors: Changes 20 Years Later

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Posterior fossa tumors account for around the 50 % of intracranial tumors in pediatric age. In the 80´s we analyzed the postoperative complications in 57 cases operated in a period of 4 years. In that group, 5 cases presented a posterior fossa hematoma, 12 a seudomeningocele, 16 a wound CSF fistula and 10 cases evolved with bacterial meningitis. Preoperative CSF shunt was implanted in 13 cases, external ventricular drain in 2 cases and postoperative shunt in 14 cases.
Since that time, changes in operative technique, like the use of haemostatic agents, strict closure of the dura, direct or with a patch, bone reposition with augmentation of foramen magnum and postoperative care managed by a team of neurosurgeons and intensivists, improved the results.
We analyze 200 consecutive surgeries performed to patients with posterior fossa tumors. To the analysis of the previous reported complications, we added the use of third-ventriculostomy to control hydrocephalus and we also analyzed the evolution of patients with pediatric posterior fossa syndrome.

0222

Brain tumors in infants: Surgical treatment and Long-term results

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Brain tumors are rare in infants, still can be challenging for neurosurgeon and late outcomes are far from being satisfactory.

105 infants with intracranial tumors were treated at the Burdenko Neurosurgical Institute from 2000 to 2010. Supratentorial tumors occurred most frequently (87 cases), while subtentorial tumors were revealed more rare (16 cases). The most preferred histology was glioma (26 %) and choroid plexus tumor (26 %), followed by ependymoma (14 %), glioneuronal tumors (9 %), PNET (7 %), teratoma (6 %), ATRT (4 %), and pineoblastoma (4 %). Surgical removal of tumors was performed in 79.6 % of infants, CSF shunting - in 10.4 %. In 9.7 % cases surgical treatment was not performed due to the poor state of patients. Total removal was performed in 71.6 % cases, subtotal - in 13.6 %, partial - in 11.1 %, biopsy - in 3.7 %. 4 intraoperative and 3 early postoperative deaths occurred. In 33.3 % cases giant and/or highly vascularized tumors were imaged. Preoperative embolization of afferent vessels and intraoperative injection of recombinant factor VIIa (rFVIIa) as well as other methods significantly reduced blood loss during surgery.

Histology is known in 81 operated infant. Tumors Gr II-IV were revealed in 60 patients, tumors Gr I - in 21 patient. Chemotherapy was given according to different chemotherapeutic protocols (HIT SKK 2000, SIOP 2000/LGG, Baby-POG). During the follow-up period 10 deaths (12 %) were recorded in the group of operated infants. The overall mortality was 20 %.

We conclude that radical removal of brain tumors in infants including giant and/or highly vascularized tumors is possible. The appropriate adjuvant therapy may remarkably improve the long term results.

0239

Two faces of DIA/DIG: location dependent malignant behaviour?

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Objective: Desmoplastic infantile astrocytoma/ganglioglioma (DIA/DIG) are rare glioneural tumors typically occurring in infants under 2 years with large uni- or multiloculated cystic masses and solid components. They are mostly located superficial with dural attachment and of benign behaviour. Very rare cases are deep seated in the skull base with an aggressive growth and seem to be a distinct entity with high mortality rate.

Methods: We present 3 cases aged between 3 month and 2 years, 2 females and 1 male. Two tumors (1 DIA, 1 DIG) were located superficial in the cortex, one with incomplete resection and one could be completely removed. Both had no further therapies. An infant with deep seated tumor (DIA) was located in the skull base. Only a subtotal resection could be achieved

Results: Both children with superficial tumors were cured and showed under follow up of 14 respectively 10 years no tumor recurrence. The infant with deep seated DIA developed shunt dependent hydrocephalus. This lesion showed a rapid growth of multiple cysts as a sign of more malignant behaviour. This tumor exhibit a BRAFV600E mutation. Due to radiological tumor progression and visual/endocrine symptoms, chemotherapy was initiated.

Conclusion: These cases and review of the literature suggest that deep seated desmoplastic infantile astrocytoma/ganglioglioma seem to be different from superficial tumors that show a more favourable outcome. The therapy options are limited and challenging. The finding of a BRAFV600E mutation could potentially point to a novel targeted treatment approach and needs further evaluation in a larger cohort.

0242

Inter-hospital transfer of pediatric patients for tumour resection at an intraoperative MRI facility – A prospective feasibility study

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Background: There is increasing evidence on use of intraoperative MRI (iMRI) for maximal safe resection of intracranial tumours in the pediatric population. This technology is costly and is not readily available at many neurosurgical units.

We carried out a prospective study on inter-hospital transportation of pediatric patients for tumour resection at a separate medical institution with iMRI facilities. The primary aim was to assess the safety of transfer of pediatric patients after a major operative procedure and the secondary aim was to validate the efficacy and benefits of performing surgery utilizing iMRI.

Methods: A work plan was designed where patients were induced under general anaesthesia and prepared for surgery at our hospital then transferred to the iMRI facility for surgery. Post-operatively, patients were transferred back for post operative care.

Results: A total of 8 patients underwent surgical resection of brain tumours at the iMRI facility. There were no complications associated with inter hospital transfer pre and post-operatively. In all 8 patients, utilization of the iMRI had an impact in influencing intra-operative decision making and assisted in maximal safe resection. The benefits of iMRI allowed for pursuit of small remnants of tumour and surgical navigation in combination with diffuse tensor imaging to map out corticospinal tracts allowed resection of tumours in close proximity to eloquent regions.

Conclusion: This pilot study shows that it is both safe and feasible for inter hospital transfer of patients in order to utilize iMRI in ensuring good outcomes for surgical resection of pediatric brain tumours.

0246

A study on the correlation between the CXCR4 expression and the recurrence of adamantinomatous craniopharyngiomas in children and a preliminary strategy of post-operative individual therapy was set up

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Objective: To investigate the correlation between the CXCR4 expression and the recurrence of adamantinomatous craniopharyngiomas, try to set up an Objective Scale System, combining the clinical data, to predict the inclination of tumor recurrence and instruct the following individual therapy.

Methods: Twenty fresh samples of adamantinomatous craniopharyngiomas were divided into two groups (11 in primary group and 9 in recurred group). The expressions of changed genes were indentified by immunohistochemistry (IHC) and quantitative real-time PCR (qRT-PCR). Combining the clinical data with the expression level of CXCR4, the Objective Scale System was established to preliminary predict the recurrent trend, and the criteria of following individual therapy was set-up.

Results: Detected by qRT-PCR, the expression level of CXCL12 and CXCR4 in recurred group was significantly higher than in primary group ($p<0.05$), and CXCR4 showed more specific. Furthermore, tested by IHC Semi-Quantitative Assessment, according to the percentage of positive cells and counting scores on the staining, combing with clinical scale, the Objective Scale System was established. The score was higher, the recurrent rate was higher, that is, the patient faced more risks of tumor recurrence, and which was used to instruct the following therapy.
Conclusion: CXCR4 may be the potential specific bio-marker to predict the recurrent trend of adamantinomatous craniopharyngiomas, even if the tumor was radically removed. The Objective Scale System we established may be a useful tool and a large number of samples should be collected to improve this system.

0247
Craniopharyngioma of the posterior fossa in pediatric population
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Craniopharyngioma of the posterior fossa in pediatric population

Craniopharingioma is a tumor that usually encountered in the supratentorioal component in pediatric population. it consists of cystic and solid portions. Anatomical calcification is depended on Chiasm . the tumor could extend in all directions but rarely in the posterior fossa.
We analyzed our data of 86 cases of pediatric craniopharingioma operated on at our unit of pediatric neurosurgery, 4 cases were in the posterior fossa.
3 of them extended retroclivaly in the posterior fossa from the posterior sellar wall while 1 case were completely separated from the sella.
Age ranged between 4 and 16 years, all the patients present with elevated ICP signs and 2 kids had facial palsy.
The latest case were solid while the others were mixed tumors.
All of them underwent a surgical removal ,the follow up period raged between 6 months and 2 years.
Postoperative imaging (MRI/CT) revealed no obvious evidence of residual tumor recurrences happened in 1 cases of cystic tumor while the solid tumor seems to be stable.

0260
Surgical strategies in management of holocord tumours in children:experience of 12 cases
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Aim: To review the various techniques which we have felt useful in management of these fairly uncommon paediatric intramedullary spinal cord tumours.
Materials And Methods: We report on our experience based on 12 cases with holocord tumours we have encountered in the last 10 years. Of the 12 patients we encountered, 7 presented with scoliosis, 3 with marked paraparesis and 2 with gait problems. Pain was a predominant feature in only 2 children. All had areas of decreased signal on T1-weighted images on MRScan with variable enhancement patterns.
We have found the following protocol to be useful:i) Staged surgeries ii)Laminoplasties ii)localizing the solid component and draining caudal and cranial cysts in case of cystic tumours, and recently iv)we have found intra-operative spinal cord monitoring using somatosensory and motor evoked potentials as very successful in helping performing aggressive removal of tumour.
Results: 9 of the 12 cases were low grade pilocytic astrocytomas where surgical resection was the only treatment offered; in 2 cases the tumours were high grade and required adjuvant radiotherapy, but neither had a good neurological outcome. In case of the low grade tumours neurological results were good and 5 year follow-up showed no tumour recurrence in 7 out of these 8.(the 8^{th} has only 2 year follow-up). 1 case clinically and radiologically diagnosed a s a holocord astrocytoma turned out to be a holocord intramedullary tuberculoma, and we have not encountered this in literature.

0263
Management of craniopharyngioma following CCLG guidelines
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Purpose: In 2005, Children's Cancer Leukaemia Group (CCLG) proposed a management pathway for treatment of craniopharyngioma. The aim of this present study is to review our single institutional experience of management of patients with craniopharyngioma diagnosed since the introduction of the CCLG guidelines in 2005. We have appraised risk factors for stratification identified in literature and introduced re-stratification after endoscopic decompression.
Methods: All children diagnosed with craniopharyngioma in a 6 years period were included. Pre-operative and post-operative assessment included: MRI, endocrine screening and ophthalmologic assessment. Management was based on the presence of hypothalamic syndrome, hydrocephalus, tumour size and the radiological Paris grading system with respect to the involvement of the floor of the III^{rd} ventricle. Endoscopic drainage and lavage of tumour cyst was performed prior to formalizing the risk grade and surgical strategy. Only after the drainage a definitive tumour assessment was achieved and definitive surgery was performed in 4-6 weeks time.
Results: Twenty patients fulfilled the inclusion criteria. Ten underwent endoscopic cyst drainage before definitive surgery. The results of the subsequent surgical excision were complete resection, near total resection or sub-total resection in 6, 5 and 9 patients respectively. There was mortality and no new neurological deficits. Nine patients underwent radiotherapy at some stage.
Conclusions: In this study we develop an advanced model for management of paediatric craniopharyngioma. An improved risk grading system may have a direct impact in surgical strategy and surgical outcome and could be able to improve morbidity related to surgical and adjuvant treatments.

0264
Paediatric and young adulthood pituitary adenomas: management pathway from a single institution
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Introduction: Long term outcomes and strong evidence data regarding management of pituitary adenomas in children remain limited. The aim of the present study is to review presentation, medical and surgical managements, endocrine and metabolic outcome.

Methods: A retrospective review of patients aged ≤21 years with pituitary tumour, from 1984 to 2011, was performed. Hospital records were reviewed regarding history, presenting features, physical examination and endocrine baseline. Type of treatment was classified as medical, surgical or both. Outcomes were described considering visual field deficits, pituitary hormone function, need for further treatment and long term sequelae.
Results: 44 patients (34 female) were included. Mean age at diagnosis was 17,1 years and mean follow up 9,6 years. Thirty patients had prolactinomas, 6 Cushing's disease (CD), one acromegaly and 7 non - functioning pituitary adenomas (NFPAs). All patients had symptoms at presentation. All prolactinoma patients received dopamine agonists (DAs) and three of them underwent surgery. In total, 12 patients underwent pituitary surgery: 6 with CD, one with acromegaly and 5 with NFPA. Four received radiotherapy after surgery. Eleven patients received hormone replacement. Thirteen patients gained significant weight, two received antihypertensive medications, two had type 2 diabetes and four were treated for dyslipaedemia.
Conclusion: Two - thirds of hormonally active tumours are prolactinomas. Treatment with DAs is safe and effective as first line treatment for prolactinomas. Surgery is required in CD and acromegaly, or in NFPAs with visual deficits. Transphenoidal surgery is feasible and safe in this category of patients

0268

Awake craniotomy and the paediatric patient; a safe & effective technique

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Introduction: Awake craniotomy is a well-established technique for achieving maximal safe tumour resection or debulking in potentially eloquent cortex for adults but is infrequently considered for the paediatric population due to perceived difficulties with the technique in this age group.
It is known that the extent of surgical resection correlates strongly with favourable outcome in paediatric glioma surgery. 10-year survival rates for paediatric patients for whom gross total resection of low grade glioma has been achieved approaches 100 %. Similarly, awake cortical mapping in epilepsy surgery potentially obviates the need for two-stage surgery.
Methods: We report our departmental experience of 3 cases that have undergone awake craniotomy for supratentorial tumours (via asleep-awake-asleep technique). We describe the pre-operative workup, anaesthetic and operative techniques for safely undertaking this surgery in children. The current literature on paediatric awake craniotomy is reviewed.
Results: The patients were aged 10, 15 and 16 years at the time of surgery. Two cases were performed for epilepsy and one for progressive tumour on serial imaging. Post-operatively, two patients had a histological diagnosis of low grade tumour and one of high grade glioma. Gross total tumour resection was achieved in all three cases, as confirmed on post-operative MRI scanning. There were no neurological deficits post-op in any of the cases. Both epilepsy patients are now completely seizure-free.
Conclusion: In appropriately selected patients, awake craniotomy is a safe and effective tool for achieving maximal resection of supratentorial tumours even in children as young as 10.

0286

Supratentorial metastases of posterior fossa medulloblastoma

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Introduction: Medulloblastoma is the most common primary tumor in children that originates in the posterior fossa . It can spread along the spinal cord and in the brain.
Objective: To analyze the patients that presented supratentorial metastases.
Materials and Methods: Between 1991 to 2006, 170 patients with medulloblastoma were operated on. Twenty seven presented supratentorial metastases. Age of presentation, histology, staging, dissemination and outcome were analyzed.
Results: Twenty seven patients (15,8 %) with medulloblastoma presented supratentorial metastases, the average age was 5,87 (range 3 to 11). 13/27 were staged as high-risk and 14/27 as standard. The average period between surgery and recurrence was 12,65 months. 12/27 presented desmoplasia. 25/27 patients died.
Conclusions: 15,8 % of the patients with medulloblastoma presented supratentorial metastases 16 months before the first surgery. All patients were younger than 12 years of age. The appearance of supratentorial metastases is not related to stage or histolgy (presence of desmoplasia). The outcome was unfavorable once the dissemination was diagnosed.

0289

Supratentorial neuroglial tumours of childhood: a retrospective analysis of outcomes

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The outcome of childhood supratentorial neuroglial tumours is not well described as for other childhood brain tumours. We present a location-based retrospective analysis of these tumours.
Methods: Ninety-nine children underwent surgery for supratentorial tumours at our institution during the period 2000 - 2010. There were 29 'lobar' neuroglial tumours and 17 deep hemispheric tumours. All the lobar tumours underwent craniotomy and excision. Total excision was possible in 21 (70 %) and subtotal excision in 8 (30 %). Amongst the deep hemispheric tumours, eight underwent stereotactic biopsy, seven subtotal excision and one total excision.
Results: The mean age was 8.5 yrs±5.0 for lobar tumours and 10.6± 3.7 for deep hemispheric tumours. There were seven ependymomas, three pilocytic astrocytomas, two pleomorphic xanthoastrocytomas, two desmoplastic infantile astrocytomas/gangliogliomas, one diffuse fibrillary astrocytoma, two anaplastic astrocytoma/gliomatosis cerebri, one glioblastoma, one astroblastoma, two oligoastrocytomas, four dysembryoplastic neuroepithelial tumours, and four gangliogliomas. Of the WHO grade 3 & 4 tumours, 7 were alive without radiological progression at mean most recent follow-up of 48±23 months, 4 expired within 31 months, and 2 lost to follow-up. Deep hemispheric tumours consisted of fourteen astrocytic tumours (WHO grade 1 - 1, grade II - 8, grade III - 2, grade IV - 3) and two oligodendroglial tumours.
Conclusion: The goal of surgery for supratentorial tumours in children should be safe total resection, as a significant percentage have good long-term recurrence-free survival. Deep-seated lesions were generally, less amenable to resection and poorly responsive to adjuvant therapies.

0296

Safe and effective resection of pediatric brain tumors using a 3-Tesla intraoperative MRI

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Introduction: High field strength intraoperative magnetic resonance imaging (iMRI) has emerged as a powerful adjunct for resection of neoplastic and non-neoplastic brain lesions. However, its exact role is institution and surgeon-dependant and continues to evolve.
Methods: We analyzed a 15-month prospective database after installation of a 3-Tesla iMRI (IMRIS, Winnipeg, Canada) to determine the impact this technology had on the surgical management of a variety of intraparenchymal entities in patients 18 years or less.
Results: Seventy-four patients (23 females, 51 males) underwent iMRI guided surgery, with an average age of 8.7 years (range, 1-18). Four had biopsies; the rest (n=70) were resections. There were 48 posterior fossa tumors (69 %). The most common tumors were pilocytic astrocytoma (26 %) and medulloblastoma (21 %). An average of 1.2 scans were performed per patient (range, 1-3). In 16 patients (23 %), residual tumor was identified on the intraoperative scan and resected. The overall gross total resection rate was 81.4 % (57/70). There were no MRI-related safety issues. The 30-day reoperation rate was 0 % and no patient required another postoperative MRI scan during the same hospital stay. Challenges included interpreting linear enhancement along the resection cavity, images obtained after multiple boluses of intravenous contrast, and correcting image-distortion due to patient positioning.
Conclusion: The learning curve with this technology applies to all members of the operating team. For every 4 iMRI cases, one potential early reoperation was avoided. iMRI is safe in children and reduces the need for early reoperation or repeat sedation for postoperative scans.

0297

Complication avoidance during resection of fourth ventricular brain tumors with brain stem invasion: value of intra-operative emg mapping of facial colliculus in preservation of facial nerve function in pediatric patients

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Introduction: Microsurgical approaches to the rhomboid fossa for resection of fourth ventricular tumors carry risks of lower cranial neuropathies including permanent facial palsy,especially in cases of brainstem invasion.Multiple reports looked at EMG mapping of facial colliculus and safe entry zones into intrinsic brainstem tumors.We review our experience and facial nerve functional outcomes with pediatric fourth ventricular tumors with brainstem invasion.
Methods: Retrospective review of operative notes,MRI images and documented pre- and post-operative facial nerve functional outcomes in pediatic patients who underwent EMG facial response mapping during microsurgical resection of fourth ventricular tumors with brainstem invasion.
Results: Six children were identified. Age range (2-16 years),average age 9.1 years. There were 3 medulloblastomas (2 classic,1 anaplastic) and 3 pilocytic astocytomas(JPA).All tumors were confirmed to be invading the brainstem on intraopertaive gross findings or on preoperative MRI imaging.After resection of fourth ventricular component of the tumor; EMG mapping of facial colliculus on each side was performed using direct stimulation followed by resection of brainstem component according to EMG findings.Average follow-up was 6 months.Post-operative MRI imaging revealed gross total resection in 5 patients and near total resection in 1 patient with JPA.Average pre-operative House-Brackmann (HB) score of facial nerve function was 1.5 (range 1-3) and average post-operative score was 1.5 (range 1-4).All patients had improved or stable HB score, except 1 patient.
Conculusion: In our small series, brainstem EMG mapping of facial colliculus proves to be a valuable tool in preserving facial nerve function in pediatric patients with fourth ventricular tumors with brainstem invasion.

9. Spine – Poster

0023

Prognostic Factors in Management of Primary Spinal Cord Astrocytoma in Children

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Introduction: Astrocytomas are the most common primary intramedullary spinal neoplasms in children. Scant data exists regarding prognostic factors and efficacy of treatment modalities.
Methods: The IRB approved study retrospectively reviewed 38 children with primary spinal astrocytomas presenting from 1981 to 2011. Multifactorial analyses examined the prognostic value of the following factors on progression free survival: symptom type and duration; tumor location, size and grade; extent of resection; chemotherapy; and radiation
Results: Tumors included 5 pilocytic astrocytomas, 20 low-grade astrocytomas and 13 anaplastic astrocytomas. 14 patients recieved biopsy only, 17 underwent partial resection, and 7 had gross total resection. Median age at resection was 124 months (range: 16-204). Mean follow-up was 45 months (range: 1-396). Sixteen children recieved chemotherapy. Twenty-two recieved radiation. Overall and progression-free survivals were 94.7 percent and 71.1 percent, respectively, at 6 months. Anaplastic astrocytomas and age over 7 years independently had significantly worse progression free survival ($p=0.003$, $p=0.008$, respectively). Extent of resection showed benefit in low-grade tumors only ($p=0.048$)
Conclusions: Anaplastic histology and age over 7 were associated with worse progression free survival. Extent of resection was associated with increased progression free survival in low-grade tumors.

0065

Langerhans' cell histiocytosis in the pediatric spine: therapeutic dynamic change of spinal deformity

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Introduction: langerhans' cell histiocytosis (LCH) is a kind of neoplasm caused by a proliferation of Langerhans' cell within the tissue. Unifocal unisystem disease is the most common and usually presents with a single lytic bone lesion. The incidence of spinal lesion is about 12.5 to 35 % in all cases of LCH.
Materials and methods: we retrospectively reviewed cases of unifocal spinal LCH in sixe children treated between 2000 and 2011 in the Taipei Veterans General Hospital. The mean age of diagnosis was 5.3 years (range, 2-10 years). A biopsy was arranged for each case. Histopathological diagnosis was achieved in 4 patients and the other two were diagnosed by radiological findings, clinical course, and the response to radiotherapy.

Results: The six patients were followed clinically for a least 12 months (mean, 55.2 months, range, 12-124 months). Two lesions were found in the cervical spine (C1 and C6), two in the thoracic spine (T4 and T6), and two in the lumbar spine (L2 and L3). Back or neck pain was the presenting symptom of all six patients. Three patients had neurological deficits. Five patients had more than 75 % collapse. All collapsed vertebral bodies and neurological deficit had a recorded recovery after radiotherapy. None of the patients had radiotherapy-related complications at the time of the most recent follow-up.
Conclusion: Spinal deformity is observed in patients with spinal LCH, the remodeling of the vertebral height and kyphosis is possible during long-term follow-up. Focal low-dose radiotherapy is effective and safe in contrlling the disease.

0079

Tuberculosis of the thoracic spine, an analysis of 22 surgically treated children

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Tuberculosis (TB) of spine (Pott's disease) is dangerous form of TB in children. There is a recent upsurge of it, due to immune compromise and multi drug resistant strains. We analyzed the symptoms, management and outcome of Pott's disease in children up to age 18 years. Patients records with clinical and follow-up details reviewed in 22 operated patients from 2006 to 2011. The amount of motor deficits, vertebral segments involved and the surgery performed were studied.
Results: The mean age was 11.8 years. The male to female ratio was 0.8. Constitutional symptoms of tuberculosis were present in 13 (59.1 %) patients. Local pain and gait weakness are most common symptoms, present in 20 (90.9 %) and 18(81.8) cases respectively. Eight patients (36.4 %) presented with complete paraplegia (Grade 0). The upper thoracic vertebrae involved in five (22.7 %), middle in six (27.3 %) and the lower thoracic vertebrae were involved in 11 (50 %) cases. Single segment vertebra was involved in ten (45.5 %) patients whereas two and three segment-vertebrae were involved in eight (36.4 %) and four (18.2 %) patients respectively. Surgery was done with anterior approach in seven (31.8 %) patients. Posterior and postero-lateral routes were used in 15 (68.2 %) patients. Spinal instrumentation was done in 4(18.2 %) patients. Seventeen (77.3 %) patients showed early signs of improvement (either motor or sensory) during the hospitalization. At thirty-six months follow-up 21 patients (95.5 %) improved in motor function. Correctable surgical complications occurred in two (9.1 %) patients. There was no mortality.
Conclusion: Pediatric Potts patients improve with surgery. Only few patients need instrumented stabilization.

0107

Pediatric glioblastoma multiform of the conus medullaris: case report

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Background: primary spinal cord neoplasm account for around 5 % of all pediatric CNS tumors, the most commonly astrocytoma . Spinal glioblastoma multiforme (GBM) is a rare entity. These tumors are aggressive and carry a poor prognosis.
Case report: 15 year old boy, presented with urine retention that was preceded by numbness & progressive weakness of his lower limbs 2 days prior to presentation. MRI showed intramedullary mass lesion of the conus medullaris.
Intervension: Emergency partial resection of an intramedullary conus medularis tumor with the use of nerve integrity monitor to stimulate the conus medullaris at the tumor as it was outlined by ultrasound and the entry point was the point of least stimulation response was carried out. Pathologic diagnosis was GBM and the patient received radiation therapy after that.
Result: Post operatively the patient was able to walk independently and was able to controlling his bladder within 4 weeks of intermittent catheterization with out post voiding residuals. Four- year follow up showed no progression of the residual tumor with no new neurological deficit.
Conclusion: GBM of the conus medularis are extremely rare, a high index of suspicion and prompt intervention can lead to satisfactory results.

0227

Eosinophilic Granuloma of the T12 vertebral body causing progressive paraplegia: case report and review of the literature

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Introduction: Langerhans' cell histiocitosis (LCH) is manifested in a various ways, the most benign being the Eosinophilic Granuloma, a self limited bone lesion commonly seen in children around 10 years of age.Vertebral body involvement can cause vertebral collapse (vertebra plana). In a few cases, it may lead to paraplegia or neurologic deficits caused by nerve root compression.
Methods: We present a case of a 11 years old boy who was seen for a spinal cord compression due to T12 eosinophilic granuloma, and perform a review of the literature about clinical and radiological features and different options of treatment for these lesions.
Results: We describe a case of an Eosinophilic Granuloma of T12 vertebral body, with extradural spread of lesion causing progressive paraplegia in a 11 years old boy. Surgical treatment (posterior approach) and intra operative biopsy were performed and the diagnosis of eosinophilic granuloma was obtained. He had immediate recovery of neurological deficit after the surgery.
Conclusions: Consensus among authors is that surgical treatment is indicated when the lesion compromise spine stability or / and is associated neurological deficits, and when biopsy is required to rule out other diagnosis. Vertebral fixation is mandatory when the lesion is on the cervico-dorsal and thoracolumbarl vertebral junction, because of the risk of instability.

0241

Spontaneous spinal epidural hematoma in toddler

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Spinal epidural hematoma has been regarded as rare lesion. There are many causes for this lesion, including hemophilia, vascular malformation, trauma and spontaneous causes. Spontaneous spinal epidural hematoma (SSEH) is a rare condition in children .We report two cases with SSEH.
Case1: A 9 month-old boy was transferred to our institution due to irritability, crying for 5 days and sudden onset paraparesis for 2 days.

Parents noticed his difficulty in standing holding on and consulted pediatrician. Guillan-Barre syndrome was suspected because of his suffering from rotavirus infection one month before. Spinal tap showed high protein and increasing cell counts. Paraparesis got worse progressively. He became paraplegic, with slight response to administration of steroid . He was referred to our hospital. MRI showed epidural mass、extended from T8 to L1. Surgery was performed four days after the onset of neurological symptoms. He had recovered fully 18 days after surgery.

Case2: A 1 year 10 month-old girl was noticed unsteady gait for one week. Parents brought her to pediatrician and she was diagnosed as hand ,foot and mouth disease, because she had fever and eruption. After alleviation of fever, gait disturbance became apparent and worsened. MRI showed epidural mass , extended from T1 to T4. Surgery was done seven days after the onset of neurological symptoms. He received rehabilitation and recovered fully one month after the surgery Both cases had no history of trauma on head and spine, nor any bleeding tendency.

10. Vascular – Poster

0044

Bifrontal encephalogaleosynangiosis (EGS) for the children with moyamoya disease

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Object: The optimal procedure to increase the cerebral blood flow (CBF) of the anterior cerebral artery (ACA) territory in patients with Moyamoya disease (MMD) has not been determined yet.

Methods: We retrospectively analyzed surgical results of pediatric patients with MMD treated with EDAS and bifrontal EGS on craniotomy or EGS on burr hole.

Results: Nine patients underwent EDAS with bifrontal EGS on craniotomy. Three patients underwent EDAS with EGS on burr hole for 5 cerebral hemispheres (with one burr hole in 2, 2 burr holes in 2, and 3 burr holes in 1). The preoperative symptoms improved in all patients of both groups. The collateral circulation in the ACA territory made by EGS was divided into 3 groups by postoperative angiography (Group A; revascularization of more than 2/3 of the ACA territory, Group B; between 1/3 and 2/3, Group C; less than 1/3). Out of 5 hemispheres treated with EGS on burr hole, 1 was evaluated as Group B and 4 as Group C. Out of 18 hemispheres treated with bifrontal EGS on craniotomy, 8 were evaluated as Group A, 7 as Group B, and 3 as Group C, which showed better revascularization than with EGS on burr hole ($p=0.0065$).

Conclusions: EDAS with bifrontal EGS on craniotomy demonstrated better revascularization and improvement of CBF in the ACA territory than with EGS on burr hole(s). Bifrontal EGS on craniotomy is considered to be a simple and effective surgical procedure for improvement of the ischemia of the ACA territory.

0075

Complete resolution of large intracranial aneurysm and cranial nerve deficits after endovascular treatment in an infant with Tuberous Sclerosis: Case Report

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Introduction: We present a case of a 9-month old with tuberous sclerosis with a giant cavernous ICA aneurysm presenting with a third nerve palsy.

Methods: A 9 month old male with the clinical hallmarks of tuberous sclerosis originally presented to the ophthalmology clinic for evaluation of a lazy right eye. He was noted to have a right sided third nerve palsy. MRI of the brain demonstrated presence of right 2.2×2.0 cm distal intercavernous giant ICA aneurysm. No evidence of subarachnoid hemorrhage. A cerebral angiogram was performed.

Procedure/ Results: A temporary balloon test occlusion of the right ICA revealed good blood flow into the right anterior and middle cerebral arteries from the left ICA via the anterior communicating artery. The test occlusion did not correlate with any neurologic deficits. The patient underwent coil embolization of the right internal carotid artery proximal to the site of the aneurysm. Follow-up injections of the right internal carotid artery demonstrated complete occlusion of the intra-cavernous ICA proximal to the site of the aneurysm (figure 3). The patient tolerated the procedure well and the remainder of his hospitalization was without complication. No new neurological deficits were appreciated after the endovascular procedure. The patient's third nerve palsy was noticeably improved prior to discharge.

Discussion: Endovascular management has gained popularity in recent years owing to the advance in technology and technical experience. Management of giant aneurysms in the pediatric population via parent vessel occlusion is a reasonable treatment option, after demonstrating safety of test occlusion.

0214

Ruptured spinal cord intramedullary aneurysm in a 13 month old infant

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Case summary: A 13 month old female presented with 3 day history of fever and ascending paralysis. Twenty four hours prior to hospitalization she stopped using her legs and 12 hours prior to presentation she became quadriplegic but had spontaneous adequate self ventilation. On examination in hospital she was alert and oriented with a high fever of 105 °F. She was flaccid in all four extremeties with no reflexes. The lumbar puncture was unremarkable but the MRI showed extensive hemorrhage within the spinal cord from C2 to T6, with an enhancing circular intramedullary lesion at T1 with feeding vessels coming to the dorsal surface of the spinal cord.

Emergency laminoplasty from C4 to T4 was carried out for evacuation of the clot to decompress the cord from within. An obvious arteriovenous malformation with a large thick walled flow aneurysm that had ruptured was encountered. The hematoma was evacuated and the aneurysm was clipped. Subsequent spinal angiogram with selective injection of the cervical and thoracic radicular vessels showed no filling of the vascular malformation.

Two weeks postoperative she regained grade 4 power in the proximal muscles of the upper limbs but her grip is still weak bilaterally at about grade 2 and she has regained grade 2 power in her lower extremeties.

Conclusion: This case is being presented to highlight the natural history of this rare entity which had not been previously described in this location in the spinal cord

0186

Entrapped microcatheter complicating endovascular embolisation of a cerebral AVM: microsurgical management

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Introduction: Cerebral arteriovenous malformations (AVMs) can be treated with stereotactic radiosurgery, endovascular obliteration, surgical excision or multi-modality combination treatment. Each approach has its own benefits, risks and potential complications. We report the entrapment of a microcatheter as a complication of endovascular liquid embolic intervention in an 8 year old girl with a posterior pericallosal AVM (Spetzler Martin grade 4).
Methods: Angiography showed the AVM was supplied by the right pericallosal artery and posterior cerebral artery (PCA); there was a large aneurysm on a PCA feeding vessel. The aneurysm was occluded with Onyx, however the microcatheter became glued to the feeding PCA vessel and attempts to retrieve it failed; it was cut at the groin and left in situ. During a second stage interventional procedure, occlusion of the aneurysm was confirmed and the feeding arteries were obliterated with Onyx. However, a posterior component of the nidus remained with persistent fistulation, which was not amenable to further endovascular treatment. Therefore the patient underwent craniotomy and microsurgical excision of the AVM with retrieval of the retained microcatheter.
Results: The AVM was safely excised and the microcatheter was removed intact from the PCA feeder without further complication. The patient made a full uneventful recovery without new neurological deficits. She is awaiting post-operative angiographic follow up.
Conclusions: Retained microcatheters are a rare complication of endovascular cerebral AVM embolism with Onyx. Craniotomy and microsurgical retrieval of Onyx entrapped microcatheters is feasible at the time of AVM excision.

0250

Successful endovascular intervention for basilar artery thrombosis in a child

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Introduction: Basilar artery thrombosis is a rare disease entity in the paediatric population with an estimated 2.5 to 7.8 per 100,000 acute ischaemic strokes developing in children. Less than 10 % are caused by thrombosis in the posterior circulation. Diagnosis is often delayed in children, and consequently acute neurovascular intervention is rarely used.
Methods: We report a case of a basilar artery thrombosis in a 5-year-old child treated with emergency thrombectomy and thrombolysis. The authors have conducted a retrospective review of the case involved, including a literature survey using PubMed. Radiographic work-up included computed tomography, computed tomography angiography and digital subtraction angiography.
Results: A 5-year-old boy was referred to our neurosurgical department following a brief period vomiting, agitation, and drowsiness. He was transferred due neurological deterioration manifesting in coma. A CT of the brain performed at his local hospital confirmed a hyperdensity within the basilar artery. Following transfer, a repeat CT revealed ischaemic changes in both cerebellar hemispheres. He underwent immediate catheter angiography, thrombectomy and thrombolysis. Subsequently, the cerebellar tissue became swollen, causing compression of the pons. This necessitated a posterior fossa craniectomy and concomitant insertion of an external ventricular drain. Neurological function was preserved upon discharge.
Conclusion: There are only a handful of cases of vertebro-basilar thrombosis receiving intra-arterial thrombolysis reported in the literature, and to our knowledge no reports have been made of thrombectomy in the paediatric setting. Our case report suggests, that provided early diagnosis of vertebra-basilar thrombosis is made, thrombectomy is a safe and beneficial treatment option.

0251

The conundrum of paediatric lenticulostriate artery aneurysm: A report of 2 cases

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Introduction: Paediatric aneurysmal haemorrhage represents a rare disease entity and poses significant challenges to management decisions. Lenticulostriate artery aneurysms are even more rare, with only 4 reported cases in the literature, within the paediatric setting. We report 2 unique cases of lenticulostriate artery aneurysm rupture causing intracerebral and intraventricular haemorrhage.
Methods: The authors have conducted a retrospective review of the cases involved, including a literature survey using PubMed. Radiographic work-up included computed tomography, computed tomography angiography and digital subtraction angiography.
Results: Both cases presented acutely to the neurosurgical department following loss of consciousness secondary to intracerebral haemorrhage with intraventricular extension associated with hydrocephalus. The patients were less than 10 years of age and had no risk factors for aneurysm development. External ventricular drains were inserted on admission. Angiography confirmed the presence of lenticulostriate artery aneurysms, one in each case, which had ruptured. In the first case, the aneurysm spontaneously obliterated after 3 months. Follow-up angiography, for the second case confirmed stable appearances of the aneurysm at 1 month, following a period of conservative treatment. Both patients were discharged home and made a complete functional recovery.
Conclusion: These cases illustrate the unique appearance of these anterior circulation aneurysms, stressing the importance of recognising their unusual anatomical location. We have treated both cases conservatively, based on the significant risk of neurological impairment should the feeding vessels have been sacrificed. Follow-up of both patients has resulted in no deficit or re-bleed. Lenticulostiate artery aneurysms present a significant challenge to the paediatric neurovascular surgeon.

0281

Progressive Temporal and Spatial Extension of Negative Correlation in Carbogen-based Cerebro-vascular Reactivity by Blood Oxygen Level-dependent MR imaging in Patients with Moyamoya Disease

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Background: Blood oxygen level-dependent (BOLD) MRI imaging combined with a technique for controlled end-tidal pCO_2 was used to

measure cerebro-vascular reactivity (CVR) in patients with moyamoya disease.
Materials and Methods: Nine patients including 11 studies of CVR were retrospectively analyzed. CVR was calculated as the BOLD signal difference during sequential carbogen delivery with end-tidal pCO_2 from 1 % to 5 %.
Results: Six non-operative cases showed limited CO_2-CVR in the territories of anterior and middle cerebral artery, compatible with the Suzuki's grading of moyamoya vessels. Two non-operative cases demonstrated with the temporal and spatial progression of negative correlation as steal phenomenon which were compatible with clinical progress of transient ischemic attack. Among three operative cases, two cases showed focal sparing of impaired CO_2-CVR in bilateral external cerebral-internal cerebral anastomotic region. Effect of reperfusion by anastomosis was impressed.
Conclusions: The parametric carbogen-based cerebro-vascular reserve provides the tool to early detect cerebro-vascular auto-regulatory reserve. The progressive temporal and spatial extension of CO_2-CVR harbor the potential to predict the risk of insufficient cerebral perfusion in moyamoya disease.

12. Brain Malformations – Poster

0027

Surgical and Socio-economic complications of congenital CNS anomalies in a developing country like Bangladesh and its probable solution

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Endeavour to manage congenital CNS anomalies are going on from the beginning of civilization. The journey to success still remains a tragic one. In the developed world where the facilities are much more abundant and people are educated and aware of health problems, it is easier to challenge the situation in a better way. But for the developing world the people are neither that literate nor that affluent to meet the requirements to face these problems appropriately. More over the health systems are not up to the mark to confront the condition suitably. These congenital anomalies of the central nervous system frequently cause severe emotional, economic, and physical hardship for both the child and the family as well as for the society and ultimately for the country. Whether diagnosed prenatally or postnatally, in practice it may be very difficult to choose the best option, considering the available facilities, medico-legal issues, religious and social taboos and economic status. During the post natal period it is more difficult for the parents to manage the child in a country like ours, mainly because of their economic constraints. Necessary surgery, rehabilitation and management of the complications of surgery often turn to be a wild goose chase. Endeavour targeted to prevention of these is the solution to give relief to those unfortunate patients and their parents. We should concentrate more on prevention than to cure and lower the incidence and thus help the ill-fated babies and the parents economically as well as morally.

0043

Endoscopic fenestrations for suprasellar arachnoid cysts

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Object: The endoscopic treatment for suprasellar arachnoid cyst (SAC) includes mainly ventriculocystostomy (VC) and ventriculocystocisternostomy (VCC). However, the appropriate treatment for SAC has not been fully determined yet. The authors present the effectiveness of endoscopic ventriculocystostomy (VC) for SAC communicating with basal cisterns, which is demonstrated by preoperative computed tomography (CT) cisternography.
Methods: We retrospectively analyzed surgical results of patients with SAC treated with endoscopic fenestration.
Results: Six consecutive patients with SAC were surgically treated using endoscopic fenestration (VC or VCC) from March 2004 to February 2011. The mean age was 18.5 months (ranged from 5 days to 37 months). Five patients were previously untreated and one patient was previously treated with ventriculo-peritoneal shunt (VPS) placement. Five patients underwent preoperative CT cisternography and communication between SAC and basal cisterns was demonstrated in 3 patients, very slight communication in one, and no communication in one. Four patients including 3 patients with communication between SAC and basal cisterns underwent VC. Two patients with very slight or no communication underwent VCC. In all patients SAC decreased in size and hydrocephalus improved postoperatively. Five patients (83 %) (3 with VC and 2 with VCC) have been stable without reoperation (mean follow-up 32.7 months). All 3 patients with communicating SAC with basal cisterns have been stable without reoperation following VC.
Conclusions: Preoperative cisternography might be useful for selecting the ensdoscopic treatment method for SAC. If SAC communicates with basal cisterns, VC could be an effective, safe, and simpler treatment option.

0050

Dilemmas and challenges in the management of a neonate of Adams- Oliver syndrome with giant aplasia cutis lesion with infection and exsanguination

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Introduction: Aplasia cutis is a rare developmental anomaly usually involving the calvarium, associated with a variable extent of defective formation of the scalp. **Adams-Oliver** syndrome is a condition mainly characterized by aplasia cutis and transverse limb defects.
Case report: A 17- days- old term female neonate was referred to us with infected scalp lesion, about 5×4 cm with necrotic eschar. We started the neonate on local and systemic parenteral antibiotics. On day 3 of conservative management, the neonate had exsanguination due to bleeding from midline with severe haemodynamic compromise requiring cardiopulmonary resuscitation. After controlling the bleed with local tamponade and resuscitating the child, she was taken for early surgery. Debridement and bipedicled rotation flap of the scalp to cover the raw area was performed. On day 18 the flap started showing signs of necrosis. The neonate was taken up for debridement and subsequently maternal allograft of split thickness skin was placed as a temporary wound cover. Meanwhile the wound showed progressive epithelialization except a smaller area where a split thickness autograft was placed leading to complete resolution.
We plan to revaluate the need for cranioplasty at around 3-4 years of age.
Discussion: We discuss the dilemmas and challenges involved in the successful management of a neonate of **Adams- Oliver** syndrome with infected aplasia cutis and an episode of life threatening exsanguination.
Conclusion: Aplasia cutis is a rare developmental anomaly usually involving the calvarium, associated with defective formation of

the scalp to a varying extent and severity, requiring various timely strategies.

0150

Dandy-Walker Syndrome: Different Modalities of treatement and outcome in 60 cases - A 15 year Instituional Experience

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Introduction: Despite advances in diagnostic modalities, the treatment of Dandy Walker Syndrome (DWS) remains controversial. we have tried to fetch out best surgical procedures among the available options.
Material and methods: outcome and complications of different CSF diversion procedures were compared to search for best method to treat Dandy Walker Syndrome (DWS) following retrospective review of 60 cases treated at our institute between 1996 to 2011.
Results: All the 60 cases had improved initially following primary CSF diversion procedures but due to recurrence of symptoms revision of shunt surgery was required . In the group of 40 cases treated primarily either with ventriculoperitoneal(30) or cystoperitoneal(10) shunt , 16 cases required revision of shunt procedure but only 2 out of 10 cases who had combined VP and CP shunt as primary procedure required revision. 2 of the 5 cases required additional VP shunt who had primary fenestration of posterior fossa cyst membrane. In the group of 5 cases with primary Endoscopic third -ventriculostomy, 2 cases recquired additional CP shunt. Additional ventriculoperitoneal(VP)or cystoperitoneal(CP) shunt procedure was required due to development of secondary aqueductal stenosis in another 10 of 30 cases treated with VP shunt and 2 cases treated with CP shunt.
Conclusion:- Altogether 22 cases could be stabilized on combined VP and CP shunt. So Whenever feasible combined ventriculoperitoneal , ETV and cystoperitoneal shunt should be used. Endoscopic third ventriculostomy reduces hard ware requirement with less morbidity in these cases but its superiority as compared to other procedures require further evaluation.

0155

Endoscopic technique in the treatment of intraventricular cysts in children

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Objective: The purpose of this study is to discuss the significance of the ventriculoscopic technique for the intraventricular cysts.
Methods: 47 patients with intraventricular cysts were reviewed including clinical manifestation,location of the cysts,neuroimaging,surgical technique and complications.The effect was evaluated by follow-up at one day,one month and three months after operation.
Results: 17 cases of the septum pellucidum cysts were found to be contracted by CT scan at the first day postop.There were no recurrence after the mean follow-up 14.23±9.837 months.14 cases of the intraventricular cysts were found to be contracted by the neuroimaging at the first day postop.Among them,2 cases had ventricular hemorrhage.4 cases had seizure preoperation,1 case still seizured postop.There were no recurrence after the mean follow-up 14.21±11.7 months.14 cases of Obstructive hydrocephalus due to third ventricle cysts and suprasellar arachnoid cysts improved one month after operation. There were 2 cases of ventricular hemorrhage ,2 cases of deutencephalon seizure. No recurrence after the mean follow-up 15.86±15.89 months.2 cases of fourth ventricle cysts due to Dandy-walker syndrome combined with hydrocephalus improved after operation.
Conclusion: The ventriculoscopic technique in the ventricular cysts was the preferred surgical procedure that can be presented with reliable efficacy and fewer complications.

0207

Symptomatic supratentorial and posterior fossa subdural hygromas complicating Chiari I decompression - A report of three cases

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The development of symtomatic supratentorial and posterior fossa subdural hygromas following posterior fossa decompression for Chiari I malformation is a rare complication with only a handful of cases reported in the literature. We report our experience with three children who developed this complication, our hypothesis on its pathogenesis and a review the treatment options.
Three girls, ages 9, 12 and 17 years presented with Chiari I malformation and extensive syringomyelia. All three patients underwent suboccipital craniectomy, C1 laminectomy and duraplasty and were discharged home three to four days after surgery. All of these patients returned to the emergency department between 7 to 14 days after surgery with headache, nausea and vomiting and signs of elevated intracranial pressure. Imaging in all three patients demonstrated posterior fossa subdural hygromas that extended through the supracerebellar cistern supratentorially to include the interhemispheric and convexity subdural compartments. Mild triventricular ventricular enlargement was also identified. None of our patients demonstrated any signs of infection.
All three patients were treated with a brief course of acetazolamide and a tapering dose of dexamethasone. Symptomatic improvement occurred rapidly and a significant reduction in the size of the subdural fluid collections and ventriculomegaly was demonstrated within 24 hours of starting treatment. None of our patients required drainage of their fluid collections. Two of our three patients showed near complete resolution of their syrinxes and presenting symptoms. The third patient's syrinx has not responded.
We will review the possible etiologies of this rare complication and the treatment options.

0229

Cervicomedullary decompression for foramen magnum stenosis in achondroplasia with sleep apnea syndrome

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Purpose: Sleep apnea syndrome(SAS)is one of the common and feasible symptoms with achondroplasia. The purpose of this study is to evaluate the indication and effect of foramen magnum decompression (FMD) for SAS associated with achondroplasia.
Patients and Method: We experienced three operative cases in a last year. Changes in symptoms, magnetic resonance images(MRI) and polysomnography(PSG) fidings were analyzed retrospectively.
Result: Patient 1 was 1 year 11 months old boy presenting 1 year 4 months history of sleep apnea.MRI revealed severe medullary compression due

to foramen magnum stenosis.PSG showed combined obstructive and central sleep apnea with apnea and hypopnea index(AHI) of 39.6. After excluding otolaryngological disease,we performed FMD.Postoperatively, SAS improved dramatically with AHI of 0.4.
Patient 2 was 9 months old boy presented obstructive type SAS with AHI of 11.4.MRI revealed medullary compression. After otolaryngological check,the patient underwent FMD.SAS was improved with AHI of 5.6.
Patient 3 was 1 year 9 months old boy presented combined type SAS with AHI of 14.8.MRI revealed foramen magnum stenosis.After otolaryngological check,the patient underwent FMD.SAS was improved.
All FMD procedures were suboccipital decompression and C1 laminectomy,with removal of epidural connective tissue without dural plasty. We simulated each operation by using 3D models and defined the width of decompression area preoeratively.None of patients had complication postoperatively.
Conclusion: FMD is effective treatment for SAS associate with achondroplasia in early preschool children period. PSG is essential to evaluate the indication and effect of operation. FMD should be considered for achondroplasia patients with foramen magnum stenosis presenting SAS.

0283

Transtentorial herniation after shunting the posterior fossa cystic malformation

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Two patients with posterior fossa cystic malformation were reported. One four-year-old boy was noted to have developmental delay, hand tremor, unsteady gait, and a retrocerebellar cyst. Initially, a low pressure cystoperitoneal shunt was inserted. The cyst decreased a little. One year later, the low-pressure valve was removed. The cyst decreased in size gradually, however, the patient started to have seizure-like attacks half a year later. The EEG was abnormal, so anticonvulsant was given. However, seizure-like attacks such as partial loss of consciousness, mild gaze problem, or generalized weakness, repeatedly occurred several months later. MRI of brain showed the development of transtentorial herniation and mild ventriculomegaly. VP shunt insertion decreased his symptoms for another half a year, but the symptoms recurred again, so we added on a programmable valve onto the cystoperitoneal shunt. The pressure setting of the valve was gradually upgraded to the same level of the VP shunt. The patient became stabilized. Another one nine-year-old girl visited our hospital 9 months after she received a cystoperitoneal shunt without a valve at another hospital. Intermittent headache, fatigue, and blurred vision were complained of. MRI of brain showed transtentorial herniation. Revision of the shunt by adding on a valve was suggested, but the family hesitated. This report emphasizes the importance of using a pressure valve while shunting a huge retrocerebellar cyst to avoid transtentorial herniation. When transtentorial herniation develops, adding on a valve onto the preexisting shunt system may improve the symptoms though the transtentorial herniation may persist on imaging study.

13. Trauma – Poster

0004

MRI findings in children with head injury. A plea for decompressive craniectomy

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Object: Head injury is the most frequent cause of death in man up to the age of fourty. Magnetic resonance imaging (MRI) is undoubtedly superior to computerized tomography (CT) in depicting brain lesions. We therefore investigated MRI findings and compared them to CT findings and analysed outcome in children.
Patients and methods: 47 children between 1 an 18 years of age, median 12 years, with a minimum of 24 hours of posttraumatic coma were subjected to MRI within 10 hours and 8 days after the injury. All patients received a cranial CT at the time of admission. All patients were sedated only to the point to ensure adequate ventilation. Duration of coma and outcome were evaluated in relation to the location of lesions as depicted by MRI.
Results: Duration of coma without a brain stem lesion ws 2,9 days. Mean duration of coma with a brain stem lesion was 8,4 days. The correlation was highly significant. Outcome as classified according to the Glasgow outcome scale also significantly correlated to the location of lesion as identified with MRI.
Conclusion: As MRI findings confirmed the importance of lesions of the brain stem, we concluded that protection of the brain stem, possibly with timely decompressive craniectomy may help to increase more favorable outcomes.

0013

Analysis of traumatic brain injuries under 12 months of age

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Objective: Traumatic brain injury(TBI) is sometimes a major cause of morbidity and mortality in young children. Children in the first year of life are less mobile but they are prone to accidents. We performed this study to describe demographic data, causes, types and outcome of TBIs under 12 months of age.
Patients and Methods One-hundred ninety-two children under 16 years of age were admitted after head injury from 2003 through 2011. Among them, forty-two(21.8 %) children under one year of age were retrospectively analyzed.
Results: There were 17 girls(41 %) and 25 boys(59 %) with a mean age of 6.1 months. Most infants were injured at home and falls were the most frequent cause of head injury. Falls from the bed accounted for more than half of the falls. The most frequent type of head injury was skull fracture. Most infants were consistent with mild head injury but the other three with moderate head injury. They underwent operations due to a subdural hematoma, epidural hematoma and depressed skull fracture, respectively. Forty-one infants showed good recovery but the other one with moderate head injury were worsened due to uncontrolled seizure.
Conclusion: Infantile TBIs recover relatively well without significant morbidity even though skull fractures are the most common type of injury. However, most TBIs under 1 year of age are preventable, especially with parents' or caregivers' careful caution or education. In addition, infant with risk of seizure should be managed with anticonvulsants to prevent from neurological deterioration after seizure.

0082

Depressed skull fracture in Ping Pong: elevation with Medeva extractor

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Introduction: The bones of the skull of the newborn and nursing infants, in general, possess great malleability. For this reason, the depressed fractures occurring at this age are called “Ping Pong” or “Green Stick” fractures. The treatment of these fractures is surgical according to different authors, although some of these fractures that happen in childbirth can elevate themselves spontaneously.
Method: We applied this procedure in fourteen children at the neurosurgery and neonatology departments of our hospital between the months of September 2003 and February 2009. A breast milk extractor trade mark “MEDEVA” was used for the procedure in newborns with a depression larger than 2 cm in diameter. Minimal aspiration was performed while observing the elevation through the transparent breast milk extractor MEDEVA until the depression elevated without leaving any trace.
Discussion: The aspiration procedure was satisfactory and curative in the fourteen children treated. The fracture was successfully elevated and the skull returned to its normal position and configuration without complications for the patients.
Conclusion: Finally, it has been demonstrated that this procedure is simple, inexpensive, and avoids surgical intervention. The social effect of this procedure in addition to the conservation of resources and the reduction of risks to a minimum prevents familial stress and provides the tranquility necessary for the mother to breast-feed the baby.

0127

Umbilical cord blood nucleated cells in the treatment of with severe traumatic brain disease: a pilot clinical study

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In the course of pilot clinical trial sponsored by Stem cell bank "CryoCenter" we studied the safety and potential efficacy of human umbilical cord blood (UCB) nucleated cells in the treatment of juvenile patients with severe traumatic brain disease (TBD). Clinical protocol was approved by Institutional Review Board, Local and Independent Ethics Committees. After informed parents' consent, six patients (3-16 years old) with TBD (grade 3; 6-24 moths after trauma) resistant to traditional therapy and/or rehabilitation schemes received two intravenous infusions of allogenic, AB0/Rh-identical, RBC-depleted UCB nucleated cells at the average dose of 250×10^6 cells per infusion with 2 weeks interval. Cell infusions were well tolerated and did not cause any adverse reactions. Control examinations by means of battery of neurophysiological, biochemical and instrumental tests at 3 and 6 months after infusion revealed significant improvement of neurological status and cognitive functions in the majority of patients. Positive dynamics of physical activity levels and daily functioning indexes were also observed.
Results: obtained so far suggest that intravenous infusion of allogenic, AB0/Rh-identical UCB nucleated cells to juvenile patients with resistant forms of TBD is safe, induces no adverse reactions and effective. Positive changes in several manifestations of disease may be related to neuroprotective and neurotrophic effects of infused UCB cells on damaged brain tissue. Further studies are required to refine indications/contra-indications for cell therapy of traumatic brain disease, the regimen of infusions and cell dosages.

0139

The Characteristics of cognitive function and Parenting Stress in the Children with Traumatic Brain Injury: The Preliminary Study

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Background: The purpose of this study was to investigate the clinical characteristics of cognitive function and parenting stress in the children with traumatic brain injury.
Methods: This study was conducted using Korean-Wechsler Intelligence Scale for Children, Rey-Kim Memory Test for children, Attention-deficit Hyperactivity disorder Diagnostic System, Korean Parenting Stress Index. 66 subjects of the children with traumatic brain injury at the age of six to fifteen who had visited hospitals in Severance Hospital in seoul and their guardians were included.
Results: The result showed that intelligence of the children with traumatic brain injury was same as the average but memory function was lower than the average, indicating relatively being declined. On visual attention, the inattention, impulsivity and reaction time is higher than the average, also showing that more than half of the subject were included in the group of higher threshold. The subjects were divided into two groups based on whether they had experienced loss of consciousness or not. By comparison the two groups, the children who had experienced loss of consciousness demonstrated significantly lower levels of Full Scale Intelligence Quotient and Performance Intelligence Quotient. The mothers in more than half of subject experienced significantly higher level of parenting stress.
Conclusions: It is suggested that the integrated intervention plan for psychological service such as supportive therapy for family and programs for parent education with medical service.

0157

Three Deaths of Babies of 192 Mortalities with Severe Traumatic Brain Injury in The Field of Neurosurgery

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Introduction: The population of severe traumatic brain injury (TBI) is associated with a high mortality and morbidity, herewith we would like to have a special attention with a death of child with severe head injury.
Method: Among 192 deaths during admission since 1999, three children were died with TBI at an intensive care unit. The intensive neurosurgical team care was adjusted with normovolemia, normothermia, hyperventilation and catecholamines to maintain an adequate cerebral perfusion pressure.
Results: The decompressive craniectomies underwent around 86 (44.8 %)among 192 adult mortalities and those were caused by 167 (87 %) the brain death, 21(11 %)sepsis and 4(2 %) others. The mean period of admission was 11.6 days. Otherwise, three children were died among 195 death patients of severe traumatic brain injury. All three were died within the first 24 hours and all of them could not undergo decompressive craniectomy and other surgery due to unstable vital signs. The mode of trauma was 2 pedestrian traffic accidents, 1 fall

down. There were 1 male and 2 female. Mean age were 4 years old. Mean modified Glasgow Coma Scale for pediatric scale score was 3.
Conclusion: All parents should have a special attention to prevent the mortalities of severe TBI by traffic accidents and fall down in period of childhood because their babies were died in a day without say anything through the most beautiful life.

0183

Decompressive craniectomy and subsequent cranioplasty-critical look at our center over last decade in pediatric severe head injuries

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Objective: Our experience with strict criteria to offer decompressive craniectomy (DC) and subsequent cranioplasty (CP, timing & technique) is reported.
Methods: Successive 520 children (aged<16) admitted to Neurotrauma with severe head injury (SHI, comatose and typical CT findings) during 2002-2011.
Results: Included are 386 without mass lesion (EM) and 134 operated for mass lesion, in 38 the therapy included DC (7.3 % of series, 28.4 % of EM). Clinical selection for DC was divided to 23 cases (60.5 %) primary operation starting within 95 minutes of admission or with intensive care period of an average 10 hours in 15 children. Although first month mortality was extremely high compared to the whole series - 31.6 % vs. 5 %, it is still a 2:3 chance of saving life. Twenty-six survivors underwent CP of their deep freeze bone within 65 days of trauma (31 % within a month). Two patients had an additional calvarial bone split and in the last 10 patients the operation was under continuous TCD monitoring or CSF drainage. Four had infection needing removal of plate (15.4 %) that was for now replaced in one with synthetic plate (after 2.5 years). Six had ventriculomegaly needing pre/post CP shunting (23 %, of whom 1 died 58 months after trauma).
Conclusions: DC in desperate clinical situations is rare but still has the ability to make useful survival if done on time and in children. After the acute phase, within the first month the need for CP should be assessed as it may assist in rehabilitation process and has minor complications.

0257

Evaluation of radiological findings of pediatric abusive head trauma How can we differentiate AHT from accidental head trauma?

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There are many controversies in biomechanics of abusive head trauma (AHT). The causing force of AHT is not only shaking but also direct impact with hitting, dropping, throwing and pressing. It is very important to evaluate that how mechanical force made the various radiological and clinical findings.
Materials and methods: 74 cases (50 males , 24 females) of AHT including the suspected cases from 1 month to 5 years 8 months. The mechanical force was obtained by confession during investigation of detectives or court, or professional interview at child guidance center.
Result: are most common. Fourteen were dead, 14 showed severe disabilities, 41 were normal and 5 are lost of follow-up. We classified six types according to radiological findings and analyzed possibilities of abuse in each type. Type 1; Eight cases showed multiple or single skull fracture with or without subarachnoid hemorrhage, brain swelling ,and epidural hematoma. Type 2; six have diffuse brain injury with multiple contusion or cerebral hematoma. Type 3; Nine are acute thick subdural hematoma with herniaion. Type 4; Twenty eight have acute thin subdural hematoma with diffuse brain swelling. Type 5; Five showed chronic subdural hematoma with new bleeding. Type 6; Eighteen showed thin, mild subdural hematoma without parenchyma injury.
Conclusion: Precise evaluation will contribute to approach the tool to differentiate AHT from accidental head trauma.

0299

Conservative treatment of epidural hematomas in childhood based on the experience of 81 cases

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Since 2007, in the Hospital da Restauração (Recife - Brazil), we initiated a study of expectant treatment of epidurales hematoma in children. The first series of 12 cases was presented in Cape Town in 2008. Even now, with more than 80 cases, there is still resistance in the adoption of a conservative protocol for epidural hematomas in childhood. The authors present the continuation of the study, now with a series involving 81 patients aged 0,6 to 13 years old. All cases presented mild symptoms, headache and vomitings, but were neurologically normal and presenting Glasgow Coma Scale (GCS) 15 by the admission. The volume of hematoma ranged from 4 cc to 80 cc. Half of the lesion were located in the frontal and fronto-parietal lobe. The diagnosis was made by computed tomography (CCT). All patients underwent a close clinical monitoring and subjected to control by computerized tomography 6 - 8 hours after admission. The average hospital stay was 4 days. Based on our experience, a conservative management of epidural hematomas are indicated considering a GCS 15, normal neurologically findings, admission CCT and CCT-control without parenchymal lesions or midline shift >0,5 cm, possibility of close supervision and observation of progressive clinical improvement.

14. Infection – Poster

0132

Ventricle-proximate brain abscesses; a surgical analysis of 12 cases in children

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Pyogenic brain abscess is one of the most critical diagnoses in children. When the brain abscess: develops in proximity to the ventricular system of the brain; it creates a therapeutic complexity. We define these abscesses as ventricle proximate-abscesses (VPA). In this study, 12 cases of VPA with central nervous system involvement are presented. Seven of them were girls and five boys. The major complaints were fever with headache and constitutional symptoms in seven cases, and seizures in four cases. On neurological examination, eight of the patients had signs of focal neurological deficits (67 %), and seven had papilledema (58 %). The mean size of the abscess was 4.8 centimeters. Of the eleven cases of the supratentorial VPA six were located near the temporal horn; three near the frontal horn whereas in one case each was

found contiguous with the body and the occipital horns of the lateral ventricle respectively. There was one infra-tentorial VPA. Eleven children had evidence of midline shift in the cranial imaging and three patients had hydrocephalus. All cases were treated surgically. In eight cases, neuro-naviagation guided repeated aspiration was performed, in three, craniotomy with total excision of the abscesses, and in one, subtotal excision. Eight of the abscesses (67 %) had microbial culture growth positive for S*treptococus mirabilis sp*. Two patients (17 %) abscesses were culture negative. One patient improved on conservative treatment with antibiotics after a single aspiration. One patient died of severe ventriculitis following spontaneous rupture of the abscess into ventricle. Eleven (92 %) patients improved with surgery.

0145

Neonatal scalp abscess caused by *Achromobacter xylosoxidans* after vacuum delivery

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Introduction: Neonatal scalp abscess is generally a complication of fetal scalp monitoring and is typically polymicrobial. It is rare but potentially life threatening emergency that must be differentiated from the much more common cephalhematoma. We report a case of a newborn, who developed a scalp abscess that yielded growth of *Achromobacter xylosoxidans.*

Case report: A 11 day old male infant was admitted to the neonatal intensive care unit due to swelling over the scalp. He was delivered by vacuum at 39 weeks' gestation. On the fifth day of life the baby was noted to have red line on the scalp which developed to swell thereafter. On admission, the swelling on right parietal area was noted and overlying scalp appeared to be reddened with a crust on top. Magnetic resonance imaging revealed abscess over the right parietal scalp. Ampicillin and cefoxaime were given but the size of abscess increased and became tense. So incision and drainage was done and bloody pus was drained. The biochemical findings of the pus were consistent with the characteristics of *Achromobacter xylosoxidans.* Antibiotics were changed to piperacillin and after 2 weeks he was discharged without any sequelae.

Discussion: During the intrapartum monitoring, scalp abscesses can be further complicated by skull osteomyelitis, sepsis, meningitis, epidural abscess, and death and it may be difficult to clinically differentiate an infected scalp abscess from a sterile cephalhematoma. *Achromobacter xylosoxidans* is an aerobic gram-negative bacillus that may cause opportunistic infections in immunocompromized patients and newborns.

0202

Infectious aneurysm of the carotid artery, cavernous thrombophlebitis, hypophysitis, and retroclival abscess: When sinusitis becomes a nightmare

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Isolated sphenoid sinusitis is rare in children and sinogenic intracranial complications are anecdotally reported.

A 7-year-old African-American boy presented with the rapid onset of left ophthalmoplegia after a short febrile illness. Blood cultures grew *Streptococcus milleri* and imaging demonstrated a large left intracavernous aneurysm and enhancement of the cavernous sinus. The patient was started on broad spectrum antibiotics. Repeat imaging showed the rapidly enlarged aneurysm so he underwent test balloon occlusion of the left ICA. The petrous ICA was endovascularly coiled. Over the next few weeks the left ophthalmoplegia began to resolve. Two weeks later he returned with fever and a new right ophthalmoplegia. CT showed an extensive inflammatory process of the sphenoid sinus with bony destruction of the tuberculum sellae. MRI revealed extension of the cavernous thrombophlebitis to the right side with a retroclival subperiosteal abscess, and enhancement of pituitary gland and stalk. Drainage of the abscess was undertaken through an endonasal approach and cultures grew *Streptococcus mitis*. The patient did well without further complication.

Despite sinus patency, a focal mucosal thickening in the left sphenoid sinus was retrospectively noticed on the MR of the first hospitalization, thus allowing to hypothesize the sinogenic nature of aneurysm. This case represents an exceptional association of intracranial complications following sinus infection.

Although the diagnosis of isolated sphenoid sinusitis can be challenging due to absence of specific symptoms and possible poverty of radiological findings, physicians must be aware of this condition in order to promptly detect and aggressively treat the eventual intracranial complications.

0233

Brain Abscess in children with cyanotic congenital heart disease: a retrospective analysis. How are they different?

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Introduction: Brain Abscess is a well-recognized complication of congenital cyanotic heart disease (CCHD). In the developing world the majority of patients with CCHD remain uncorrected or partially palliated. Even among those undergoing staged corrective operations the interval between operations are delayed because of economic considerations. As a result brain abscess is a significant cause of morbidity in patients with uncorrected or partially palliated CCHD.

Objective: To describe the clinical and demographic profile of patients with cardiogenic cerebral abscess and to highlight the fact that uncorrected or palliated CCHD continue to be at risk for brain abscess.

Materials and Methods: This study is a 12 year retrospective analysis on a single cohort of 21 children (age below 15 years) with diagnosed CCHD with cerebral abscess managed surgically (21/ 38 of cerebral abscess in children), at AIMS, Kochi, India from December 2000 to January of 2012. Details of variables collected include demographics, modes of presentation, diagnosis, location of abscess, details of the underlying heart disease, management of the cerebral abscess and the outcome of the management.

Results: The mean age of children involved in the study was 6.5 years (Range: 1 year and 11.5 years) with 14 males and 7 females. The surgical management involved burr hole and aspiration in 16/21 as a primary procedure. Inspite of the standardized management protocol, 9/ 21 (Out of total 13/38 cases) required reaspiration.

Conclusions: Cardiogenic origin of cerebral abscess is the commonest aetiology amongst children. Recurrence/need for reaspiration is very high in this cohort.

0235

Improving Hand-Washing Compliance in Neurosurgery ICU by using Kinect™ Sensor

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Background: Ensuring hand washing however remains the achilles heel of infection control policies in hospitals. Education, counseling, and other communication tools have met with limited success. If handwashing can be captured in 3D and analysed, it can be relatively easy to assess the level of hand washing being practiced in different areas.
Aims & Objectives: To design a system for automatic detection of hand washing 'episodes' in a specific location and for a specific individual
Materials & Methods: The Kinect sensor by Microsoft™ features an RGB camera, depth sensor and multi-array microphone running proprietary software, which provide full-body 3D motion capture, facial recognition and voice recognition capabilities. This is used for the Xbox 360 game. However, a SDK (software developmental kit) is available to allow for development of new software programs using the functionality of Kinect. After assessment of the requirements, a software program was developed at IIT, Delhi and a single Kinect sensor was placed in Neurosurgery ICU such that alcoholic handrubs placed on two adjacent beds could be observed at all times.
Results: Testing showed 100 % accuracy in detecting the hand washing motion by nurses and doctors on both beds. The software gives the number of handwashing 'episodes' in the area covered for any time period and for a specific individual. Using this data, compliance rate between different shifts in the same location, between different locations and individuals can be calculated.
Conclusions: Kinect sensor with the software developed by us offers a cost-effective and practical way to assess hand-washing in a specific location and by different individuals.

0267

Manuka Honey: Sweetness or sweet-healing of infected neurosurgery wounds?

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Introduction: Honey is an ancient remedy and its ability to rapidly clear infection, promote wound healing is due to high-levels of hydrogen peroxide production by glucose-oxidase enough to kill micro-organisms but leaves skin undamaged. Antibacterial activity varies in potency. Some honeys are no more antibacterial than sugar, others remain effective at >100-fold dilutions. "Active manuka honey"(with UMF) is produced from Leptospermum plants.
Aims & Objectives: Manuka Honey dressing was investigated in the treatment of infected neurosurgical wounds. Honey treatment of cranio-cervical and lumbosacral wound infections following surgery for myelo-meningocele repair and posterior fossa expansion is presented.
Patients & Methods: A term baby underwent repair of a lumbosacral myelomeningocele and untethering of spinal cord on day 2. A purulent discharge developed threatening dehiscence despite antibiotics. A 10 ½year old underwent posterior fossa expansion for complex craniosynostosis. Post-operatively she developed a wound infection and mild dehiscence. Manuka-Honey dressings were applied to the non-healing wounds once daily, for 7 days.
Results: Exudation of fluid reduced significantly following the honey dressings. In both cases, excellent healing and wound cover were noted. Sequential images were taken of the wounds during the very rapid healing, demonstrating healing without significant scarring and smooth skin surfaces.
Discussion: Reduction of the wound exudates suggests an anti-inflammatory action of honey. The amount of honey required on the wound and its frequency of changes are discussed.
Conclusion: Initial experience with use of Manuka Honey has been very positive. A controlled study in neurosurgical wound healing using Manuka Honey is planned.

15. Quality and Safety – Poster

0159

Initial experience of using intraoperative MRI for neurosurgical procedures in young patients: Difficulties and solutions in a developing country

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Introduction: We describe our initial experience of using Intraoperative MRI (IoMRI) in young patients of less than 21 years of age. It is more challenging to operate pediatric patients in IoMRI suite. We highlight these problems and suggest cost effective innovative solutions to overcome initial hurdles in starting this setup.
Methods: We prospectively analyzed data pertaining to 26 patients operated consecutively between August 2011 and March 2012. Neuronavigation was used in all the patients. In case of residual tumors, a fresh MRI was acquired and subsequently further tumor resection was carried out. Demographic profile, duration of procedure, problems encountered, and results of surgery were analyzed.
Results: Mean age of patients was 14.6 years (Range 2-20 Years). 19 (73 %) were males. 15 (57.7 %) had supratentorial gliomas, 4 (15.4 %) had hydrocephalous, 3 (11.5 %) had pituitary adenoma. In 2 (7 %) biopsy of suspected lesions was done. Time taken for preoperative MRI was 29 mins (Range 12-60 mins). In 5 patients (out of 15 glioma cases), residual tumor was observed for which further resection was carried out. Postoperative MRI needed 19 mins (Range5 to 34 mins) and average duration of surgery was 5.5 hours (Range 1.3 to 10 hours). No procedure related complications were observed.
Conclusions: The problems encountered in pediatric patients are maintaining normothermia, fixation of head and prolongation of anesthesia time. Properly trained staff and minor innovative solutions are key for overcoming initial hurdles in starting this setup. IoMRI is extremely useful in achieving extended resection of residual tumors in pediatric patients.

0167

Cranial Arachnoid cyst in children a study of 75 patients

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Introduction: Arachnoid cysts are common condition in children, however, not many large series are published in the literature. Recently endoscopy has gained popularity. This paper analyses the clinical parameters and outcome of arachnoid cyst treated over a 20 years period.
Method and Observations: It is a retrospective analysis of children below 20 years of age, over a 20 year period 1991-2011. During this period 75, children with cranial arachnoid cyst were managed, at our Institute. All the patients had CT/MRI or both. Patients were operated and followed up 6 months - 2 years.

Results: 50 % children were below the age of 5 years. The mean age was 8 yrs and 65 % were boys. Headache was most complaint, recorded in patients (66 %) followed by motor deficit in 27 (35 %) patients. Seizure and visual deterioration was recorded in 20 (27 %) and 18 (24 %) patients respectively. In 44 patients cysts were supratentorial and in 21 patients (28 %) cysts were infratentorial. Craniotomy and excision was carried out in 31 (40 %) and endoscopic fenestation of cysts in 27 (35 %) patients. V.P. Shunt and cystoperitoneal shunt was performed 8 and 7 patients respectively (10 % each).
Conclusion: Overall improvement recorded in 88 % and 10 % remained static. There was deterioration of symptom in 2 % patients. Higher incidence of complications were noticed in craniotomy patients.

0188

Intraoperative application of neurosonography in the pediatric neurosurgery

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Introduction: Neurosonography is a basic diagnostic method of neurosurgical pathology at children of the first year of life. Purpose of our work was to investigate the efficiency of intraoperative neurosonography in pediatric neurosurgery.
Methods: In pediatric department of SI "Institute of Neurosurgery of NÀÌS of Ukraine" 82 intraoperative sonography were executed. Age of children was from 2 weeks to 14 years. The ultrasonic devices of Sonoline SI-200 (Siemens), Logic Book XP (GE) were used with probes 3,5-10 Mhz.
Results: At 9 patients the puncture and aspiration of deep abscesses were performed. At 28 patients with multilocated hydrocephalus ventriculoperitoneostomy was executed. In these cases intraoperative sonography was applied for the providing of miniinvasive surgical manipulations. Punctures of abscesses and cysts were conducted under permanent visual ultrasound control that enable with high exactness to control position and motion of instruments, preventing the damages of nearby cerebral structures.
For 35 children with small subtentorial intracranial tumours, located in functional areas of brain, intraoperatine sonography can determine the adequate surgical access. Under control of neurosonography 10 biopsies of deep located tumors were executed. Ultrasonic monitoring helped to specify localization of pathological process, to correlate his location with ventricular system of brain and vessels, to choose the optimal area of surgical access, to control the radicalism of manipulations, to diagnose possible intraoperative complications.
Conclusions: The application of intraoperative neurosonography can allow to decrease the volume of injury of brain tissue during surgical manipulations and operations, to shorten the time of operations.

0200

Cartoon Assisted Fundoscopic Exam (CAFÉ): Playing a video significantly improves the success, ease, and time needed to perform fundoscopic exams in children

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Introduction: Fundoscopy is an important component of the neurological examination, but can be challenging in uncooperative children. This study looked at whether viewing a video (selected by patient or caregiver) during eye examination, improves the success, duration and ease of pediatric fundoscopy.
Methods: We completed a single-practitioner, block-randomized study. In a pediatric neurosurgery clinic, patients 1-8 years old were randomized (by eye examined) to video/non-video assisted fundoscopy; non-video eye served as internal control. Successful exams were defined as visualizing the fundus within 60 seconds. Parents and examiner ranked the level of difficulty of each exam (10-point Likert scale). Success rate, time of exam, and Likert scales were analyzed using Wilcoxen signed ranks and Fisher's exact test.
Results: There were 33 female and 27 male subjects, with a median age of 3.7 years. In both younger (under 4 years) and older patients (4-8 years) time needed to properly visualize the optic disk improved during video presentation (Δ=19.7 s and Δ=14.7 s respectively, both $p<0.001$), as did success rate in the younger age group (29.0 %-87.1 % $p<0.0001$); success rate did not change in the older age group ($p=0.5000$). In all ages, parents and physician found a statistically significant improvement of ease of examination ($p<0.01$).
Conclusion: Videos improved the ease, time, and importantly, success of fundoscopy in younger children. There was no effect on success rate in older children, but improved time and perceived difficulty. This simple, inexpensive adjunct to the ophthalmalogical assessment has great potential to improve the ease and efficacy of this aspect of the neurological examination.

0223

Paediatric white matter tractography: an overview of its technical limitations

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Introduction: Diffusion tensor imaging (DTI) is an imaging technique that allows estimation of white matter pathways from diffusion imaging data. To date, higher tensor tractography derived from DTI remains the best *in vivo* method for white matter studies. Whilst this imaging technique has been widely utilized in adult patients, its paediatric application remains less well defined.
This paper summarises the current state of paediatric white matter tractography with particular focus paid to its technical limitations in the pediatric population.
Method: A PubMed search was performed, using terms: paediatric white matter tractography, and diffusion tensor imaging. All relevant literature published to date were included in this review.
Results: The generation of paediatric white matter tractography poses unique challenges owing to the ongoing maturation of the central nervous system in children, the necessity for age adapted diffusion acquisition settings and tracking algorithms and the inability to validate tractography using direct cortical and subcortical stimulation in paediatric subjects. There is a lack of paediatric normative standards rendering interpretation of studies difficult. There are no paediatric studies available assessing peri-operative and intra-operative white matter tractography and their relationship to patients' neurological and functional outcome.
Conclusion: White matter tractography is a valuable imaging modality however clinicians need to be aware of its technical limitations. There is clearly a need for more paediatric tractography studies. In particular, we wish to highlight the need to generate a comprehensive paediatric tractography atlas, as well as the need for studies using peri-operative and intra-operative white matter tractography.